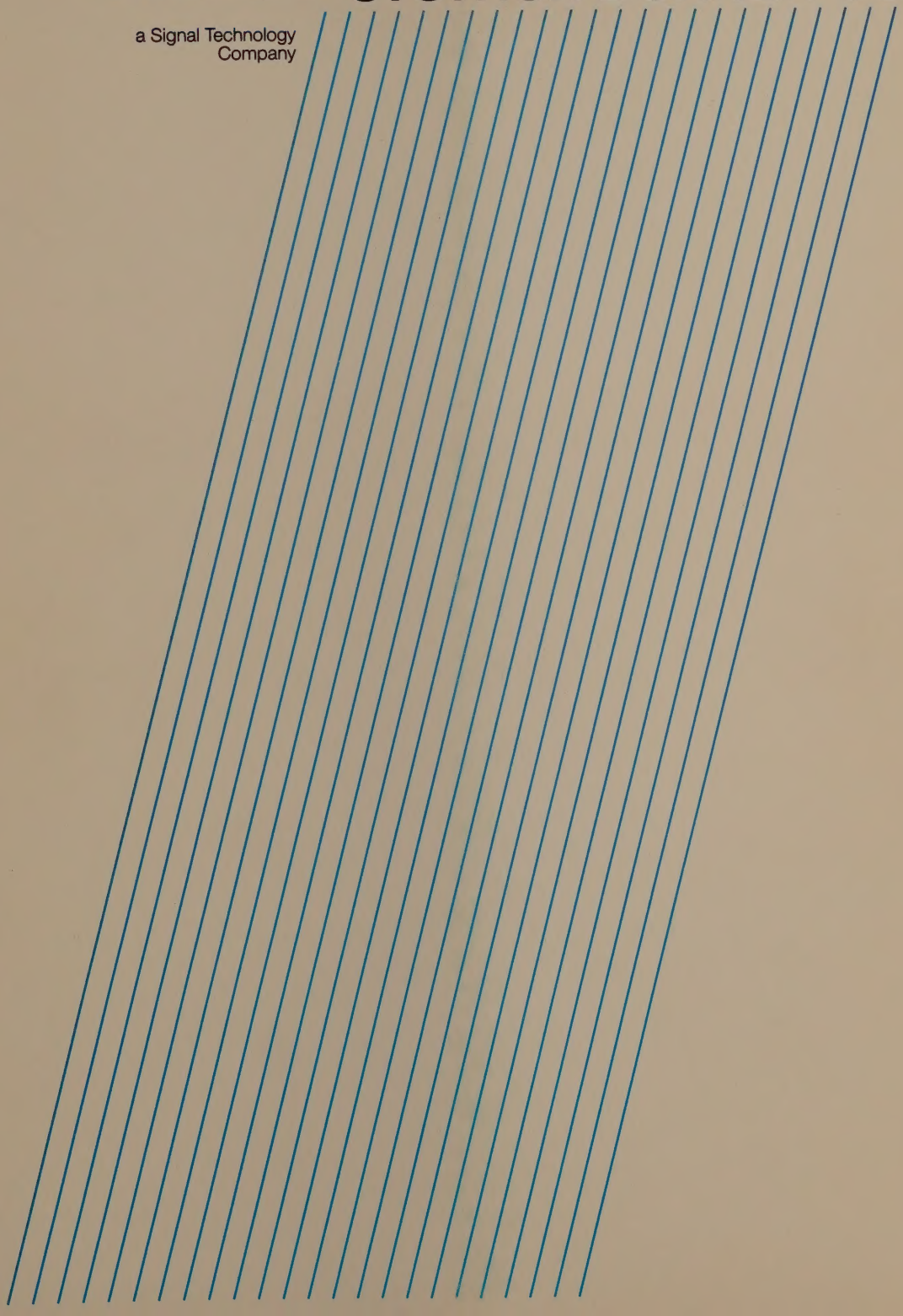
QFP SERIES

SYSTRON DONNER CORP.

a Signal Technology Company



QFP SERIES

SYSTRON DONNER CORP.

INSTRUMENT DIVISION

QUARTER RACK PROGRAMMABLE POWER SUPPLIES

DOCUMENT NO. 120082-01

OPERATING AND SERVICE MANUAL

13100 Telfair Ave.
Sylmar, CA 91342

Tel. 818.362.9900
FAX 818.362.1035

Copyright © 1982 Systron Donner
Printed in U.S.A.

LIST OF EFFECTIVE PAGES

(Revision/Configuration Control Document)

The QFP Series Power Supply Operating and Service Manual is a revision/configuration-controlled document. Original pages are date coded 9-85; pages changed in the future will be indicated according to respective revision date(s).

Total Number Of Pages In This Publication Is 79, Consisting Of The Following:

Page No.	Issue Date	Page No.	Issue Date
Title			
Warranty	1985	2-1 - 2-7/(2-8 blank)	9-85
Proprietary Rights Statement . . .	1982	3-1 - 3-5/(3-6 blank)	9-85
List of Effective Pages - A . . .	9-85	4-1 - 4-4	9-85
Table of Contents i - iii	9-85	5-1 - 5-36	9-85
1-1 - 1-5/(1-6 blank)	9-85	6-1 - 6-25/(6-26 blank)	9-85

TABLE OF CONTENTS

CHAPTER		PAGE
1 - GENERAL INFORMATION		
1-1	Introduction	1-1
1-4	Effectivity of Manual . .	1-1
1-6	Description	1-1
1-9	Specifications	1-1
1-11	Environmental and Physical Characteristics . . .	1-5
1-13	Saftey Practices	1-5
2 - INSTALLATION AND OPERATION		
2-1	Introduction	2-1
2-3	Receiving Inspection . .	2-1
2-6	Preparation for Reshipment	2-1
2-8	Installation	2-1
2-11	Operating Environment . .	2-2
2-13	Power Requirements . . .	2-2
2-18	Output Connections . . .	2-2
2-25	Front Panel	2-3
2-27	Rear Panel	2-5
3 - PRINCIPLES OF OPERATION		
3-1	Introduction	3-1
3-3	Functional Description .	3-1
3-5	Main Power Circuit . . .	3-1
3-10	Auxiliary Power Circuit .	3-2
3-12	Voltage Stabilization and Control	3-2
3-17	Current Sink Circuit . .	3-2
3-19	Current Stabilization and Control	3-3
3-24	Voltage Limit and Overvoltage circuitry	3-3
3-33	Power Supply Shut-Down Function	3-4
3-35	Single and Dual Polarity Output Relay Functions .	3-5
4 - MAINTENANCE		
4-1	Introduction	4-1
4-3	Preventative Maintenance.	4-1
4-5	Fan Maintenance	4-1
4-7	Interior Cleaning	4-1
4-9	Exterior Cleaning	4-1
4-11	Lubrication	4-1

CHAPTER		PAGE
4 - MAINTENANCE (Cont'd)		
4-13	Visual Inspection	4-2
4-16	Test Equipment Required .	4-2
4-20	Calibration Procedure . .	4-2
4-22	V-ZERO Adjustment	4-3
4-23	V-CAL Adjustment	4-3
4-24	Vn CAL Adjustment	4-3
4-26	I ZERO Adjustment	4-3
4-27	I CAL Adjustment	4-3
4-28	Service Alignment Procedure	4-3
4-31	Calibration Procedure . .	4-3
4-32	V-ZERO Adjustment	4-4
4-35	V-CAL Adjustment	4-4
4-36	-Vn BAL Adjustment . . .	4-4
5 - REPLACEABLE PARTS		
5-1	Introduction	5-1
5-3	Part Ordering Information	5-1
5-6	Parts Lists	5-1
	QFP26-5 Power Supply 07914603	5-4
	QFP36-4 Power Supply 07914604	5-4
	Ship Kit 079185	5-5
	Test Assembly QFP26-5 07914703	5-6
	Test Assembly QFP36-5 07914704	5-7
	Fan Assembly 07916601 . .	5-8
	Output Cable Assembly 07921902	5-9
	Top Heatsink Assembly QFP26-5 07915403	5-10
	Top Heatsink Assembly QFP36-4 07915404	5-10
	HS Right Hinged QFP26-5 Assembly 07904303	5-11
	HS Right Hinged QFP36-4 Assembly 07904304	5-11
	HS and Support Assembly QFP26-5 07904403	5-12
	HS and Support Assembly QFP36-4 07904404	5-13
	.053 Ohm Shunt Assembly 07915503	5-14

TABLE OF CONTENTS (Cont'd)

CHAPTER PAGE

5 - REPLACEABLE PARTS (Cont'd)

HS-J4 Cable Assembly 07915902 5-15
Ribbon Cable Assembly 06585602 5-15
Control PCB Assembly QFP26-5 06582908 5-16
Control PCB Assembly QFP36-4 06582909 5-19
P2-P4 Cable Assembly 07916101 5-22
Feature 01 Line Voltage 079186 5-23
Std 50-60 Hz/115 VAC 07918601 5-24
Opt. 10 50-60 Hz/100 VAC 07918602 5-24
Opt. 11 50-60 Hz/208 VAC 07918603 5-24
Opt. 12 50-60 Hz/220 VAC 07918604 5-24
Opt. 13 50-60 Hz/230 VAC 07918605 5-25
Opt. 14 50-60 Hz/240 VAC 07918606 5-25
Feature 02 Meters QFP26-5 07918703 5-26
Feature 02 Meters QFP36-4 07918704 5-26
Std Front Panel 07905101. 5-27
Indicator PCB Assembly 07905401 5-28
Front Panel W/O Meters Cable Assembly 07910401 . 5-29
Opt. 30 Front Panel With Meters QFP26-5 07905003 . 5-30
Opt. 30 Front Panel With Meters QFP36-4 07905004 . 5-30
0-30 V Meter Assembly 07906801 5-31
0-40 V Meter Assembly 07906901 5-31
0-4 A Meter Assembly 07906301 5-31
0-5 A Meter Assembly 06421002 5-31
Meter Cal PCB Assembly 07905301 5-32

CHAPTER PAGE

5 - REPLACEABLE PARTS (Cont'd)

Front Panel W/Meters Cable Assembly 07910402 . 5-33
Feature 03 Output Switching 07918802 . . . 5-34
Std Single Polarity Output 07904001 5-35
Opt. 31 Dual Polarity Output 07904002 5-36

6 - DRAWINGS

6-1 Introduction 6-1

LIST OF FIGURES

FIGURE PAGE

2-1 Load Lead Wire Size Nomograph 2-4
2-2 QFP Series Front Panel Functions 2-7
2-3 QFP Series Rear Panel Functions 2-7
4-1 Test Cable 4-2
6-1 QFP Series Outline Drawing 079057 6-3
6-2 QFP Shipping Assembly 079146TAB 6-4
6-3 Test Assembly 079147TAB. 6-5
6-4 Fan Assembly 07916601 . . 6-6
6-5 Output Cable Assembly 07921902 6-7
6-6 Top Heatsink Assembly 079154TAB 6-8
6-7 Heatsink Right Hinged Assembly 07903TAB 6-9
6-8 HS and Support Assembly 079044TAB (Sheet 1 of 2). 6-10
6-8 HS and Support Assemby 079044TAB (Sheet 2 of 2). 6-11
6-9 Shunt Assembly 07915503 . 6-12
6-10 J2-P1 Ribbon Cable Assembly 06585602 6-13
6-11 A1, Control PC Assembly 065829TAB 6-14
6-12 P2-P4 Cable Assembly 07916101 6-15

LIST OF FIGURES (Cont'd)

FIGURE		PAGE
6-13	Feature 01, Line Voltage Options Assembly 079186TAB.	6-16
6-14	Std Front Panel (No Meters) Assembly 07905101	6-17
6-15	Indicator PC Assembly 07905401	6-18
6-16	Feature 02, Opt 30 Front Panel W/Meters Assembly 079050TAB	6-19
6-17	Meter Cal PC Assembly 07905301	6-20
6-18	Relay PC Assy 079040TAB . .	6-21
6-19	QFP26-5 Schematic 07905803.	6-22
6-20	QFP36-4 Schematic 07905804.	6-23
6-21	Single Polarity Relay Board Schematic 07904001	6-24
6-22	Dual Polarity Relay Board Schematic 07904002	6-25

LIST OF TABLES

TABLE		PAGE
1-1	QFP Series Power Supplies Specifications. .	1-3
1-2	QFP Series Environmental and Physical Characteristics	1-5
2-1	Power Transformer Primary Connections . . .	2-2
2-2	Output Connectors Pin Designations and Keying .	2-3
2-3	Front Panel Functions . .	2-5
2-4	Rear Panel Functions . . .	2-5
2-5	J2 Programming Connector Pin Designations	2-6
4-1	Recommended Test Equipment	4-2
4-2	Voltage Readings	4-4
5-1	Manufacturer's Code-to-Name Index	5-2

CHAPTER 1

GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This operating and service manual contains information relating to the installation, operation, maintenance and calibration of the Systron Donner QFP Series Power Supplies.

1-3. The information contained in this manual is divided into front matter and six descriptive chapters, indicated in the following format.

Front Matter: includes the title page, warranty policy, proprietary rights statement, list of effective pages and Table of contents

Chapter 1 - General Information: contains a general description of the QFP Series and safety practices.

Chapter 2 - Installation and Operation: describes unpacking and receiving inspection, installation criteria, system interface with the P6/P12 Programmers, power requirements, connection to loads and/or units under test (UUT). Instructions on preperation for reshipment are also provided.

Chapter 3 - Principles of Operation: provides a functional description of the Power Supply and is referenced to schmatic diagrams located in Chapter 6 of this manual.

Chapter 4 - Maintenance: describes the steps required for routine maintenance, inspection, and alignment.

Chapter 5 - Replaceable Parts: component parts are listed in this chapter along with parts ordering information and manufacturer's code-to-name index.

Chapter 6 - Drawings: provides technical personnel with the required schematics and component location diagrams to support maintenance and troubleshooting of the QFP Power Supplies.

1-4. EFFECTIVITY OF MANUAL

1-5. Information contained in this operating and service manual is date-coded at the bottom of each page. A summary of these date codes is given in the list of Effective Pages (A page) located within the front matter of this manual. Any future changes to this manual will be reflected in the List of Effective Pages.

1-6. DESCRIPTION

1-7. The QFP Supplies are modular in design to allow a compact multiple output programmable system configuration for use in automatic test equipment (ATE) systems when used in conjunction with the P6/P12 Programmers. The P6/P12 Programmers will allow up to fifteen power supplies to be controlled via a General Purpose Interface Bus (GPIB) which conforms to IEEE Std 488-1978. Refer to P6/P12 Programmer Operating and Service Manual Systron Donner document number 120071-01 for detailed information on the Programmer.

1-8. Each QFP module is a compact, precision, dissipative regulator, housed in a quarter rack chassis thus, allowing a compact multiple output rack assembly. Systron Donner RA4 rack assemblies provide the rack mounting for the power supplies and their associated P6 Programmers.

1-9. SPECIFICATIONS

1-10. Table 1-1 provides the performance specifications for each supply in the QFP Series.

Table 1-1. QFP Series Power Sup

	Models						
	6-12	16-7	26-5	36-4	60-2.5	75-2	1
1. Programmable Range							
Voltage Mode	0-6 V	0-16 V	0-26 V	0-36 V	0-60 V	0-75 V	0
Current Mode	0-12 A	0-7 A	0-5 A	0-4 A	0-2.5 A	0-2 A	0
2. Stability							
Voltage Mode	0.3 mV	0.8 mV	1.3 mV	1.8 mV	3.0 mV	3.75 mV	5
Current Mode	2.4 mA	1.4 mA	1.0 mA	800 µA	500 µA	400 µA	3
3. Pard (RMS)							
Voltage Mode	120 µV	320 µV	520 µV	720 µV	1.2 mV	1.5 mV	2
Current Mode	1.2 mA	700 µA	500 µA	400 µA	250 µA	200 µA	1
4. Load Effect							
Voltage Mode	120 µA	320 µV	520 µV	720 µV	1.2 mV	1.5 mV	2
Current Mode	1.0 mA	1.0 mA	1.0 mA	1.0 mA	1.0 mA	1.0 mA	1
5. Source Effect							
Voltage Mode	60 µV	160 µV	260 µV	360 µV	600 µV	750 µV	1
Current Mode	600 µA	350 µA	250 µA	200 µA	125 µA	100 µA	7
6. Temperature Effect/°C							
Voltage Mode	0.3 mV	0.8 mV	1.3 mV	1.8 mV	3.0 mV	3.75 mV	5
Current Mode	2.4 mA	1.4 mA	1.0 mA	800 µA	500 µA	400 µA	3
7. V_{LIM} Programmable Range	0-6.6 V	0-17.6 V	0-28.6 V	0-39.6 V	0-66 V	0-82.5 V	0
8. Crowbar Threshold (±10%)	0.12 V	0.32 V	0.52 V	0.72 V	1.2 V	1.5 V	2

		Definitions
)-1.5	200-.8	Programmable Range: the obtainable range that can be programmed with the normal 0 to +10 V input.
.00 V ..5 A	0-200 V 0-0.8 A	
) mV) µA	10.0 mV 160 µA	Stability: The output drift over 8-hours under constant line, load and temperature after a 30-minute warm-up.
) mV) µA	4.0 mV 80 µA	PARD: Periodic and random deviations from stabilized output, measured from 20 Hz to 4 MHz.
) mV) mA	4.0 mV 1.0 mA	Load Effect: The change in stabilized output caused by a load change equal to the output rating.
) mV µA	2.0 mV 40 µA	Source Effect: The change in stabilized output per °C in ambient temperature, over the operating range of 0°C to +50°C.
) mV) µA	10.0 mV 160 µA	Temperature Effect: The change in stabilized output per °C in ambient temperature over the operating range of 0°C to +50°C.
10 V	0-220 V	V_{LIM} Programmable Range: The obtainable voltage limit range.
) V	4.0 V	Crowbar Threshold: The nominal voltage above V_{LIM} at which the crowbar will trip. The crowbar will not trip reliably for Vout <3 volts.

1-11. ENVIRONMENTAL AND PHYSICAL CHARACTERISTICS

1-12. Table 1-2 lists the environmental and physical characteristics of the QFP. Figure 6-1 provides an outline drawing with dimensional data.

1-13. SAFETY PRACTICES

1-14. Prior to operation or maintenance of the QFP Series Power Supplies, Technical personnel are encouraged to review all safety procedures in this manual. Removal of the cover panels while the Power Supply has line power applied, exposes personnel to possible contact with high voltage and high current sources. Always remove line power from the unit when servicing, and only allow qualified personnel to maintain this Power Supply.

Table 1-2. QFP Series Environmental and Physical Characteristics

Storage Temperature:	-40 to +75°C
Operating Temperature:	0 to 50°C
Operating Humidity:	0 to 95% relative, noncondensing
Vibration (MIL-STD-810):	0.33 mm at 5 to 55 Hz
Power:	115/230 V rms ±10% 47 to 63 Hz 260 Watts maximum
Dimensions:	
Height	5.22 in (13.25 cm)
Width	3.91 in (9.93 cm)
Depth:	18.87 in (47.93 cm)
Front Panel Handle Projection:	1.50 in (3.81 cm)
Weight:	
Shipping	19.5 lbs (8.9 kg)
Net	15.5 lbs (7.0 kg)

CHAPTER 2

INSTALLATION AND OPERATION

2-1. INTRODUCTION

2-2. This chapter outlines the procedures for initial inspection, installation and operation of the QFP Power Supplies. Instructions concerning preparation for reshipment are also included should the Power Supply be returned to Systron Donner for service or repair.

2-3. RECEIVING INSPECTION

2-4. Prior to accepting the power supply from the shipper, inspect the condition of the shipping container for any indication of freight damage. Any sign of such damage must be noted by both the shipper and receiver and should be reported to the insurance investigator.

2-5. Immediately following removal of the power supply from the shipping carton, inspect for possible physical damage incurred during shipment. Check external surfaces for scratches or dents and note the condition of all connectors, circuit breakers, etc. that protrude from the front and rear panels of the rack assemblies. Should any damage be detected, notify your nearest Systron Donner representative - DO NOT USE THE INSTRUMENT UNTIL INSTRUCTED TO DO SO BY THE REPRESENTATIVE.

2-6. PREPARATION FOR RESHIPMENT

2-7. When the Power Supply is repackaged for shipment, use original packing materials or package in accordance with MIL-P-116 and MIL-3-17555E specifications. Repackage the instrument using the following step procedures:

1. Attach an identification tag to the system indicating model and serial number, name and address of instrument owner, and a summary of the service or repairs required.
2. Wrap the assemblies in sheets of heavy paper or plastic prior to placing it in the shipping container.
3. Select a strong carton or wooden box as a shipping container.
4. Use an adequate layer of shock absorbing material on all six sides of the unit. Protect the instrument front panel and panels with additional layers of cardboard. Ensure that no movement of the assembly is evident within the container.
5. Seal shipping container with strong tape or metal bands. Attach a packing list to the outside surface.
6. Mark shipping container "FRAGILE-DELICATE INSTRUMENT" and attach the appropriate handling symbols to ensure reasonable care in transit.
7. Be certain all correspondence relating to service or repair of the system includes information contained on the power supply identification tag.

2-8. INSTALLATION

2-9. The QFP Power Supplies are designed to mount into the Systron Donner RA4 rack assemblies. Four quarter rack power supplies may be installed into a RA4 rack assembly. Rear panel shear alignment pins, guide holes and front panel captive module locking fasteners, provide for the installation of the module into the RA4 Rack Assembly.

2-10. The RA4 Rack Assembly requires a rack space envelope of 5.22 in (13.25 cm) high, 16.97 in (43.10 cm) wide and

22 in (55.88 cm) deep; 3 in (7.62 cm) of the depth requirement is for rear panel protrusion and clearance of cables and connectors. The RA4 rack assembly is provided with provisions for installation of rack mounting slides. Refer to the related programmable power supply manual for detailed system installation requirements.

2-11. OPERATING ENVIRONMENT

2-12. Each QFP Series Power Supply has been designed to meet the following environmental requirements:

Operating temperature:	0 to +50°C.
Non-operating temperature:	-40 to +75°C.
Humidity:	0 to 95% relative non-condensing.

2-13. POWER REQUIREMENTS

2-14. All QFP Supplies require 115/220 V ac ±10% 47 to 63 Hz line power. Power consumption is 260 watts maximum. Heavy duty 3 wire detachable line cord with molded NEMA type 5-15P plug provides for the input power connection via rear panel IEC type connector J1.

2-15. The power supply is shipped from the factory normally wired for 115 V unless it was ordered with a 220 V system or requested by the customer that 220 V operation be provided. Prior to operation ensure that the unit is wired for the correct line voltage application. To reconfigure input line voltage rewire the primary windings of transformer T1 in accordance with Table 2-1.

2-16. The Power Supply is provided with a front panel 3 A circuit breaker CB1 which provides overload protection and facilitates the application and removal of the line power. When changing from 115 to 208 V or higher, the circuit breaker must be changed to 1.5 A to maintain proper supply protection.

Table 2-1. Power Transformer Primary Connections

Voltage	Line Connection	Jumper
100 V	1,4	1-3, 2-5
115 V	1,5	1-3, 2-5
208/220	1,4	2-3
230/240	1,5	2-3

WARNING

Before applying power, ensure that the protective ground terminals of the Power Supply module is connected to the protective conductor of the (mains) power cord. The cord plug shall only be inserted into an outlet provided with protective ground contact. The protective conductor must not be negated by the use of an extension cord without a protective grounding conductor.

2-17. The power handling ability of the ac mains feeding the ac power to the line cords must be considered as serious losses in regulation and substantial increase in ripple can occur as a consequence of insufficient power handling capacity of these mains. The impedance from the breaker box to the Power Supply input receptacle should not exceed 0.25 ohms. All ac feed line connections must be securely tightened and any moveable electric contact surface (such as the wiper arm of a variable transformer) should be kept clean of impedance producing oxide coatings.

2-18. OUTPUT CONNECTIONS

2-19. The output of the Power Supply to the UUT load is provided for by a rear panel 5-pin circular twist lock connector J3, ITT Cannon PT0014-5S (Key). The required mating connector (not supplied), is ITT Cannon KPT06B-14-5P (Key). Table

2-2 provides the pin designations for the output connector J3 and the key required.

Table 2-2. Output Connectors Pin Designations and Keying

Pin	Function	Keying and Model
A	Ground	Z QFP6,16
B	+ V Output	X QFP26,36
C	+ Sense	W QFP55,75
D	- Sense	Y QFP100,200
E	- V Output	

2-20. The + V output and + sense and - V output and - sense connector pins may be jumpered to allow local sensing, or sense leads can be connected to the UUT load to allow remote sensing, noting however, that a voltage drop of 1.0 V per power lead must not be exceeded.

NOTE

If sense leads are not connected to the UUT or the connector +V and -V output pins, the Power Supply regulation cannot be maintained. The Power Supply outputs must be configured for either local or remote sensing. However, builtin circuitry is provided to protect the Power Supplies and load from damage should a sense lead or jumper open.

2-21. When interfacing the Power Supplies output with the UUT loads, ascertain if local or remote sensing is to be used. If local sensing is used, ensure that pins B and C and D and E are jumpered at the mating connector. If remote sensing is used connect sense leads between the + sense (pin C) and - sense (pin D) of the mating connector and the UUT load. If long sensing leads are required, they should be a shielded twisted pair, with the shield grounded at the Power Supply mating connector pin A and the load end left open.

2-22. Ensure that the power leads connecting the + V and - V output of the Power Supply to the UUT load is of sufficient gage to carry the maximum current rating of the Power Supply outputs (a minimum of 500 circular mils per ampere is recommended).

2-23. To determine the proper wire size (AWG) for load leads, a nomograph (figure 2-1) is provided. The wire size is determined by two factors: maximum current carrying capacity recommended for any AWG (500 circular mils per ampere) and maximum tolerable voltage drop across a load lead (1.0 V per lead).

2-24. To find maximum current capacity for standard wire size (AWG), lay a straight edge from the AWG on scale 2 to point A on scale 3, then read the maximum current off scale 1. To find the voltage drop in mV/ft for a known wire size and operating current, lay a straight edge from the operating current on scale 1 to the AWG on scale 2. Then read the voltage drop on scale 3. To find the wire size required for a known operating current and the maximum tolerable voltage drop across the supply leads, first ascertain the maximum tolerable IR drop in mV/ft of lead (sum of the positive and negative leads). Then lay a straight edge from this value on scale 3 to the known maximum operating current on scale 1 and read the wire size in AWG on scale 2.

2-25. FRONT PANEL

2-26. The meters, indicators, circuit breaker and other features located on the front panel of the Power Supply are described in Table 2-3. Figure 2-2 depicts these functions by index number.

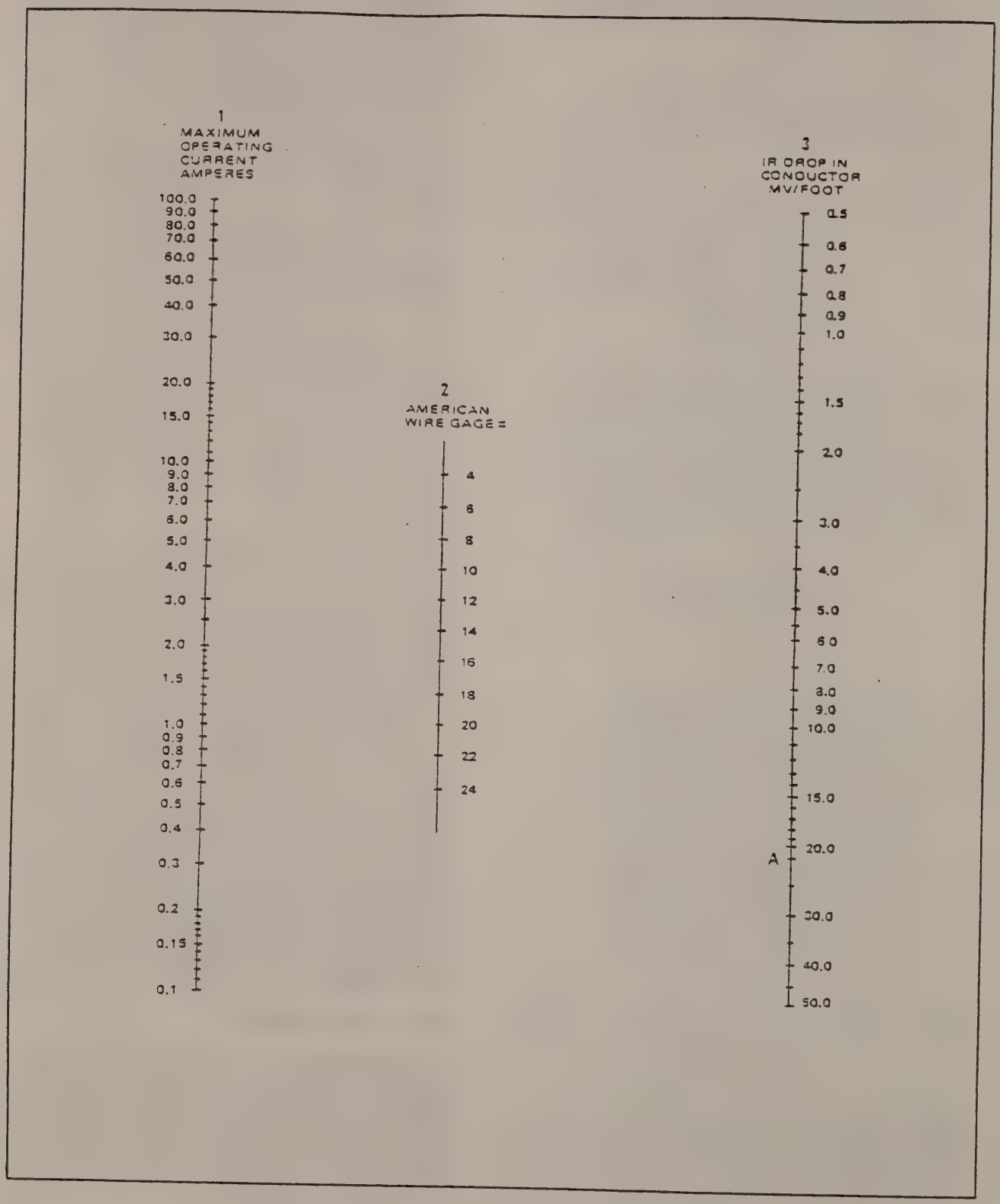


Figure 2-1. Load Lead Wire Size Nomograph

Table 2-3.
Front Panel Functions

Index	Name	Function
1	AC ON	A 3 A circuit breaker, provides overload protection and facilitates the application and removal of the line power.
2	VOLTS	A voltmeter, indicates the output voltage of the Power Supply.
3	AMPERES	An ammeter, indicates the current being supplied to the load by the Power Supply.
4	CLOSED	An orange LED indicator, illuminates when the output relay is closed, indicating that the output of the Power Supply is being applied to rear panel output connector J3.
5	VOLTAGE MODE	A green LED indicator, illuminates when the Power Supply is operating in the voltage stabilization mode.
6	CURRENT MODE	A yellow LED indicator, illuminates when the Power Supply is operating in the current stabilization mode.
7	OV	A red LED indicator illuminates when the Power Supply is in the voltage limit (V_{LIM}) mode. If the supply is latched in the Crowbar state the Voltage Mode green LED will extinguish.
8		A captive module locking fasteners, secures the Power Supply module into the RA4 rack assembly. Rotate CCW to disengage and CW to engage.

Table 2-3.
Front Panel Functions (Cont'd)

2-27. REAR PANEL

2-28. The connectors and other rear panel features are described in Table 2-4. Figure 2-3 depicts their location by index number. Table 2-2 provides the pin designations for output connector J3. Pin designations for the programming connector J2 are provided in Table 2-5.

Table 2-4.
Rear Panel Functions

Index	Name	Function
1	J1	An IEC type power receptical, provided for the connection of line power.
2	J2	A 25-pin connector, provided for the interface with the P6/P12 Programmer. Refer to Table 2-5 for the pin designations of this programming connector.
3	J3	A 5-pin circular twist lock connector, provides for the interface with the UUT load. Refer to Table 2-2 for the pin designations of this output connector.

Table 2-4.
Rear Panel Functions (Cont'd)

Index	Name	Function
4		A shear alignment pin guide hole, provides for the proper alignment of the Power Supply module when being inserted into the RA4 rack assembly.
5		Air Exhaust (Fan), removes heat from the internal heat sink. DO NOT OBSTRUCT AIR FLOW THROUGH THIS PORT.

Table 2-5. J2 Programming
Connector Pin Designations

Pin	Function
1 thru 4	Signal common referenced to +V of the power supply.
5	+15 V referenced +V

Table 2-5. J2 Programming
Connector Pin Designations (Cont'd)

Pin	Function
6	OV Latch Reset Command
7	Not Used
8	Not Used
9	Not Used
10	Voltage Mode Flag.
11	Current Mode Flag
12	Overvoltage (V_{LIM}) Flag
13	Not Used
14	Voltage Control Input (0 to +10 V)
15	Normalized -V Output (0 to -10 V)
16	Current Control Input (0 to +10 V)
17	Not Used
18	Voltage Limit (V_{LIM}) Control Input (0 to +10 V)
19	Output Enable (+5 V)
20	Close Output Relay (CLOSE Command)
21	Polarity Reverse (REV command)
22	Not Used
23	Flag Common (+5 V Logic return)
24	Over Temperature Flag
25	Output Relay Closed Flag

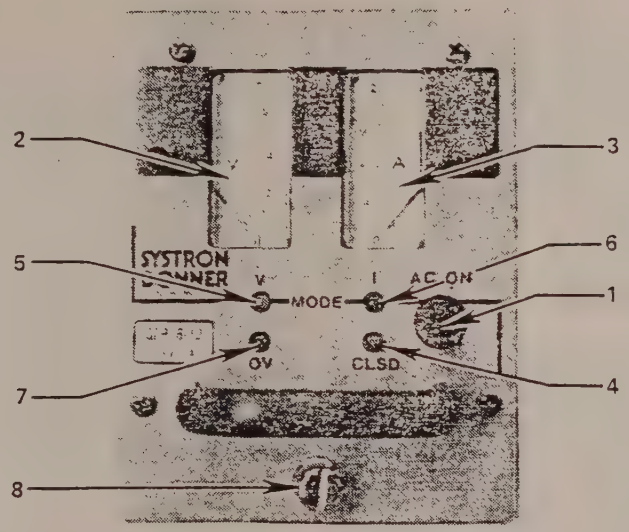


Figure 2-2. QFP Series Front Panel Functions

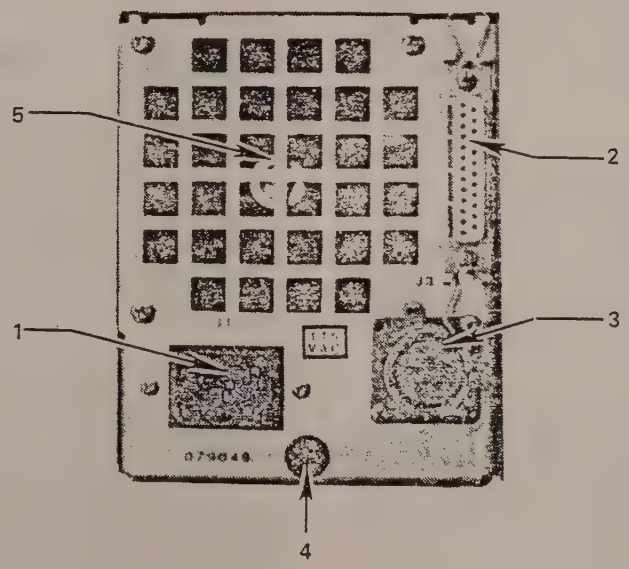


Figure 2-3. QFP Series Rear Panel Functions

CHAPTER 3

PRINCIPLES OF OPERATION

3-1. INTRODUCTION

3-2. The following functional description is referenced to the QFP Series schmatic diagrams located in chapter 6 of this manual.

3-3. FUNCTIONAL DESCRIPTION

3-4. The overall function of the Power Supply is to transform and rectify the ac input line voltage into a well regulated, stable and adjustable dc output. In performing this function, the circuitry is divided into the following subfunctions:

1. Main Power Circuit.
2. Auxilary Power Circuit.
3. Voltage Stabilization and Control.
4. Current Stabilization and Control.
5. Voltage Limit and Overvoltage Circuitry.
6. Shut-down Circuits.
7. Output Relay Functions.

3-5. MAIN POWER CIRCUIT

3-6. All power for the supply is fed through the detachable line cord to the rear panel connector J1. Front panel mounted circuit breaker CB1 provides protection from overload fault conditions and for the application and removal of line power.

3-7. Transformer T1, is the power source. The load is supplied from secondary taps 6-7-8. The transformer primary may be strapped for 115 or 230 V ac line operation. For QFP models, other than QFP6-12, fullwave bridge rectifier CR1 provides the rectification. Two capacitors C3 and C4 arranged in series, provide the filtering. A fullwave center-tap rectifier, CR1 is used for the QFP6-12. Capacitors C3 and C4 are arranged in parallel to provide the filtering. Resistors R1 and R2 function as bleeders to discharge the filter capacitors when power is removed.

WARNING

Before servicing any QFP module, always wait at least one minute after power is removed. This is to allow the filter capacitors sufficient time to discharge to a non-hazardous potential.

3-8. For QFP models other than the QFP 6-12, two parallel source pass transistors Q1 and Q2 function as a preregulator. Their bases are biased by variable voltage regulator A1U10 which is adjusted by potentiometer A1R55 to provide a voltage approximately 3.5 V above the output of the series pass circuit. The two parallel load pass transistors Q3 and Q4 are controlled by voltage control amplifier A1U1 via emitter follower A1Q1. For the QFP6-12, four parallel transistors Q1 through Q4, function as the series pass element without a preregulated input. Their bases are controlled by amplifier A1U1 via emitter follower A1Q1.

3-9. Output from the pass transistors is fed through the shunt R9 (mounted on the heat sink) and then to the rear panel output connector J3 pin B (+V) via the A2 Relay PC Assembly. Additional filtering is provided by C6 across the output of the supply. Diode CR4 protects the supply from any externally applied reverse voltage.

3-10. AUXILIARY POWER CIRCUIT

3-11. Additional fixed voltages are requird to operate the control circuitry of the Power Supply. This is obtained from T1 secondary taps 9-10-11 which is applied to the A1 Control PC Assembly auxiliary rectifier A1CR1. Bridge rectifier A1CR1 and filter capacitors A1C1 and A1C2, supply raw +22 V to A1U7, a +15 V IC voltage regulator and raw -22 V to A1U8 and A1U9 which are -6 V and -15 V IC voltage regulators.

NOTE

The auxiliary Power Supply voltages are referenced to the A1 Control PC Assembly power common which is symbolized as (△) on the schematic diagrams.

3-12. VOLTAGE STABILIZATION AND CONTROL

3-13. In the voltage stabilization mode, the output voltage of the power supply is controlled by the combination of voltage control amplifier A1U1, emitter follower A1Q1, sense amplifier A1U4 and the heat sink mounted series pass transistors Q1 through Q4. They form the major part of a closed loop, negative feedback control system. The output stage (pass transistors) function as an inverter when measuring from +V, thus A1U1 input pin 3 is actually the inverting input. Pin 2 is then the noninverting or refererence input and is connected to +V via A1R5.

NOTE

On the schematic +V is indicated by an inverted triangle symbol (▽), which is the signal common refererence for the control functions.

3-14. The input resistance to A1U1 pin 3 is the series combination of A1R1, A1R2 and A1R3. It is adjusted by potentiometer A1R1 (V CAL) to a nominal 10 kΩ. The input voltage from 0 to +10 V is referenced to +V (▽) and is supplied by the DAC Assembly in the P6/P12 Programmer. The feedback resistor A1R4 receives the $-V_n$ (normalized -V) signal from the sense feedback amplifier A1U4. -Vn ranges from 0 to -10 V and is also referenced to +V (▽). The ratio of power supply output voltage (at the sense terminals) to the programming voltage is determined by the ratio of R30+R31 to R28+R29. For good common mode rejection in shifting the reference to +V, the ratio of R34+R36+R69 to R27 must also match.

3-15. Transistor Q4 supplies a small reverse current to the Power Supplies output. To program 0 V output will require the pass transistor to flow an equal current. This allows the voltage amplifier U1 to provide control at 0 or near 0 V output and allows for a small leakage current in the pass transistors.

3-16. The output of A1U1-6 is normally between 1.8 V and 2.4 V for the QFP200-.8 while it is between 2.8 V and 3.5 V for the other QFP models. Hence A1Q2 is normally biased off. However during down programming, A1U1-6 will go negative until the output of the Power Supply drops to its programmed lower value. This negative potential turnson A1Q2 via A1CR4 and A1R17. Transistor A1Q2 is current limited to about 1.5 mA by resistor A1R19 and by diodes A1CR12 and A1CR13. This A1Q2 current supplies gate drive to the "pull down" FET Q5 located on the Heat Sink Assembly. The pull down FET, current limited by source resistor R8 and A1Q6, discharge C6 and any external load capacitance. Hence the output supply voltage can be "pulled down" rapidly from a high output voltage.

3-17. CURRENT SINK CIRCUIT

3-18. The current sink (pulldown) circuit provides for the discharge of the power supply output capacitor C6 and any

external capacitance related to the load during dynamic down programming of the Power Supply.

3-19. CURRENT STABILIZATION AND CONTROL

3-20. The current stabilization and control function will sharply limit the amount of current which can be delivered to the load. The current supplied is obviously a function of the load impedance: no load no current; short circuit maximum programmed current. The crossover from constant voltage to constant current stabilization mode is automatic. The point at which the stabilization mode switches over is a function of the load and occurs at a critical value of the load resistance $R_C = Ep/Ip$, where E_p is the programmed voltage value and Ip is the programmed current value.

3-21. Current control is provided by operational amplifier A1U3. A sampling of the output current is provided by the voltage drop across the current measuring shunt R9. The input side of the shunt is connected to A1U3-2 via A1R16 as a reference level. The other input pin 3 is the summing junction and is connected to the negative feedback current from A1R12 (I CAL) potentiometer and resistor A1R13 and the current control 0 to 10 V programming level from the DAC PC Assembly in the P6/P12 Programmer. In the current stabilization mode, these two currents are equal and opposite so that the potential on pins 2 and 3 are equal. The shunt R9 resistance is chosen so that a full rated output current will develop a corresponding -1 mA through R13 and R12. Thus, the current control input current is from 0 to +1 mA.

3-22. The output of the operational amplifier A1U3-6 is connected through diode A1CR14 to pin 8 of A1U1. Pin 8 serves as an auxiliary input to the voltage amplifier and will control its output at pin 6. When operating in the current mode the input to A1U3-3 is only slightly negative so that the output at pin 6 goes low enough to control the loop.

3-23. When the Power Supply is not in the current mode, isolation diode A1CR14 is back biased and the current amplifier A1U3 has no effect on the power supply operation. A1U3-6 is also connected to inverter A1U11-6, which feeds inverter drivers A1U12-6 and A1U12-2 in tandem. Inverter driver A1U12-6 connects through optical isolator A1U6-3 to the front panel CURRENT MODE LED DS2. It generates an isolated current flag at A1J1-14 when the current amplifier A1U3 has control of the loop. Inverter driver A1U12-2 connects through optical isolator A1U5-3 to the front panel VOLTAGE MODE LED DS1. It generates an isolated voltage mode flag at connector A1J1-15 when not in the current mode.

3-24. VOLTAGE LIMIT AND OVERVOLTAGE CIRCUITRY

3-25. Operational amplifier A1U2B is the voltage limit (V_{LIM}) control amplifier. The reference input pin 6 is connectd to +V through A1R40. Pin 5 is the summing junction: the feedback resistor is A1R37 and valued at 11.00 kΩ. The programmed voltage applied to the V_{LIM} input at A1R36 (valued at 10.00 kΩ) is normally higher that the voltage programming input to A1U1-3. Thus, the output voltage of the power supply is normally below the V_{LIM} set point. Under these conditions the positive input current to A1U2B is greater than the feedback current. The excess from the summing junction flows through diode A1CR23 to +V. The net effect is a positive potential being placed on A1U2B-5, which drives the output A1U2B-7 positive. This positive potential causes CR16 to be back-biased and hence A1U2B will not con trol the output of A1U1. When the output-voltage exceeds the V_{LIM} setpoint, however, a negative potential is placed on A1U2B-5 driving A1U2B-7 negative. Isolating diode A1CR16 conducts, and allows, A1U2B to control the output of A1U1 instead of the voltage control programming input at A1U1-3. Any further increase in the voltage programming input at A1U1-3 will have no effect, because the Power

Supply output is clamped and controlled by the V_{LIM} setpoint by A1U2B.

3-26. A1U2B output at pin 7 is also connected to inverter A1U11-4 which feeds inverter driver A1U12-4. Inverter driver A1U12-4 connects to optical isolator A1U5-2 which will illuminate the power supplies front panel OV LED DS4 and generate an isolated overvoltage flag at A1J1-13 when the V_{LIM} amplifier A1U2B is controlling the unit.

3-27. The overvoltage (crowbar) function provides additional protection and operates in conjunction with the V_{LIM} circuit. Its purpose is to ensure that the output voltage does not exceed a maximum preset level under external or internal fault conditions by placing a short (crowbar) across the output of the Power Supply if the output voltage exceeds the V_{LIM} setting by 2% of the rated output.

3-28. This is accomplished by amplifier A1U2A which together with its associated circuit components functions as a latching comparator. Its noninverting input pin 3 is connected to the corresponding input on the V_{LIM} amplifier (A1U2B-5) through resistor A1R38. Therefore it receives the same signal relative to the output versus the limiting setting. However, its output (A1U2-1) does not change sign (from + to -) when the V_{LIM} amplifier takes control because the reference input is biased at -0.1 V by resistors A1R41 and A1R42. If the V_{LIM} circuit cannot control the output, either by reducing the drive to the pass transistors or operating the current sink circuit and the power supply output goes up an additional 2% of rated output, A1U2-3 will go negative with respect to pin 2. At this point, the output at A1U2-1 will go negative, which is fedback via diode A1CR25 and resistor A1R39 to A1U2-3. This will latch up the comparator in its overvoltage state.

3-29. Comparator A1U2A has three outputs. The first one via Zener A1CR34, turns on transistor driver A1Q3 which generates a current pulse at its collector to fire the crowbar SCR CR3 located on the Heat Sink Assembly. When the SCR fires, it rapidly pulls down any voltage present at the power supply output to less than 1 V.

3-30. The second output of A1U2A is via isolating diode A1CR15 to A1U1-8. This is a somewhat redundant series pass drive pull-down, duplicated by the V_{LIM} amplifier A1U2B via diode A1CR16. This pull-down will remain as long as A1U2A stays latched.

3-31. The third output of A1U2A operates the OV flag and front panel OV LED indicator via inverter A1U11-2. Diodes A1CR26, A1CR27 and inverter A1U11-4 form a NOR gate such that if either the V_{LIM} amplifier (A1U2B) is in control or the crowbar comparator (A1U2A) is latched, the output at A1U12-4 will be low. This output draws current from the +15 V auxiliary power supply source via the front panel OV LED indicator DS3 and optical isolator A1U5A. The latter provides the optically isolated OV flag from A1U5-7 to connector A1J1-13. In order to differentiate between a V_{LIM} overvoltage condition and an overvoltage which generated crowbar, it is configured so that the crowbar latch extinguishes the VOLTAGE MODE LED and drops the VM flag. This is done by inverter A1U12-12 which goes low only when the supply is crowbarred. Its output pulls down the input of driver A1U12-2 via diode A1CR28, which sets A1U12-2 high.

3-32. Once the fault condition that caused the crowbar is cleard, A1U2A can be reset (unlatched) by a positive OV Latch Reset pulse via connector A1J1-19.

3-33. POWER SUPPLY SHUT-DOWN FUNCTION

3-34. Amplifier A1U13 provides for the shut-down of the power supply via diode A1CR17 to pin 8 of A1U1, when a $\overline{SD}$ gate from the A2 Relay Assembly is generated on a power supply open/close or polarity

reversal operation. The Power Supply will also shut-down when the Heat Sink Assembly exceeds a temperature of 131°C causing the overtemperature switch on the Heat Sink Assembly to close. When this switch closes, a low is placed on A1U13-3 via CR30 so that CR17 conducts, also causing a shut-down of the Power Supply. A low is placed on optical isolator A1U6-2 which generates an isolated over-temperature at connector A1J1-11.

3-35. SINGLE AND DUAL POLARITY OUTPUT RELAY FUNCTIONS

3-36. Relay Assembly A2 provides the logic and relay switching for single polarity and for dual polarity output relay open/close operations. Four different PCB configurations are provided for in the QFP Power Supply Series. For the lower current units ≤5 A, mercury reed relays, mounted on the Relay Board are used for main power output switching. For the higher current supplies mercury plunger relays are used, mounted off the Relay Board.

3-37. The single polarity board using a single reed relay will be explained first. Raw +22 V output from the auxiliary rectifier A1CR1 is applied to A2J2-5 to provide relay solenoid voltage and input to the +5 V on board voltage regulator A2U5. Exclusive NOR gates A2U1-4 and A1U1-11 function as a state change detector and will generate an inverted pulse at A2U1-11 when the $\overline{\text{CLS}}$ signal from A2J2-3 changes state. Dual one-shot multivibrator A2U2 will trigger on the positive edge. One-shot A2U2-6 will generate a 9 ms duration pulse on the detection of an open/close operation command, which is inverted by A2U1-10 to generate the $\overline{\text{SD}}$ output at A2J2-2. This shut down signal is applied to the A1 PC Assembly which will shut down the Power Supply for a 9 ms period to allow for the opening or closing of the output relay. One-shot A2U2-10 will generate a 4 ms pulse on the detection of an open/close operation command. This is applied to A2U4-5 which is gated with the $\overline{\text{CLS}}$ command applied to A2U4-6. Gate A2U4-4 will output an inverted $\overline{\text{CLS}}$ signal delayed 4 ms from the $\overline{\text{CLS}}$ command. This is applied to transistor A2Q1 which will close relays A2K1 (sense load relay) if $\overline{\text{CLS}}$ is low. If $\overline{\text{CLS}}$ is high then relay A2K1 is left open. Gate A2U4-3 also outputs an inverted $\overline{\text{CLS}}$ signal delayed 4 µs from the $\overline{\text{CLS}}$ command. This is applied to transistor A2Q2 which will close relay A2K2 if $\overline{\text{CLS}}$ is low. When relay A2K2 closes, a $\overline{\text{CLSD}}$ flag is generated via optoisolator A2U6 and applied to the A1 PC Assembly, via connector A2J2-6. From there it is fed back to the P6/P12 Programmer via A1J1-12. The $\overline{\text{CLS}}$ command is also applied to transistor A1Q5 via diode A1CR31 to illuminate the front panel CLOSED led indicator via inverter A1U12-10.

3-38. The dual polarity board has an additional mercury reed relay installed. Exclusve NOR gates A2U1-3 and A2U1-11 function as a state change detector and will generate an inverted pulse at A2U1-11 when the $\overline{\text{REV}}$ signal from A2J2-1 changes state. Dual one-shot multivibrator A2U2 will trigger on a positive edge. One shot A2U2-6 will generate a 9 ms duration pulse on the detection of a polarity change command, which is inverted by A2U1-10 to generate the $\overline{\text{SD}}$ output at A2J2-2. One shot A2U2-10 will generate a 4 µs pulse on the detection of a polarity change command. This pulse is applied to A2U4-12 which is gated with the REV + CLS from A2U3-4. Gates A2U4-11 and A2U4-10 generate a $\overline{\text{REV}}$-$\overline{\text{CLS}}$ signal delayed 4 µs from the $\overline{\text{REV}}$ command. The net effect is to close sense relay A2K3 and main power relay A2K4. Relays A2K1 and A2K2 are open.

3-39. When the relays are mounted on the chassis, the $\overline{\text{SD}}$ pulse width is increased to 120 µs, while the pulse width from A2U2-10 is increased to 60 µs. This increase is due to the slower operating time of the mercury plunger relays as compared with the mercury reed relays.

CHAPTER 4

MAINTENANCE

4-1. INTRODUCTION

4-2. This chapter contains the procedures for preventative maintenance and calibration for the QFP Power Supplies.

4-3. PREVENTATIVE MAINTENANCE

4-4. Preventative maintenance consists primarily of cleaning and visual inspection. When performed on schedule, preventive maintenance will prevent possible power supply breakdown and improve the reliability of the Power Supply. Severity of environment, to which the power supply is subjected, will determine the frequency of the periodic maintenance A convienient time to perform preventive maintenance is just before recalibration.

4-5. Fan Maintenance

4-6. The fan in each member of the QFP series should be replaced every 40,000 hours of operation. New fans may be ordered from the manufacturer or from Systron Donner.

4-7. Interior Cleaning

4-8. Dust on the interior of the power supply must be removed due to its electrical conductivity when high-humidity is present. Dust can also cause overheating and component breakdown. Dust or dirt on components surfaces acts a a thermal insulating blanket and thus prevents heat sinking, which can lead to component failure. The recommended way to remove accumulated dust is to blow it off with dry oil-free low pressure air Any dirt that remains should be removed with a soft brush or lint free cloth dampened with a proper cleaning agent. A cotton-tipped applicator ("Q-tip") should be used to clean in narrow spaces or around components on the printed circuit boards.

CAUTION

Certain components within the power supply can be damaged by use of carbon-based solvents. Avoid use of chemicals that contain acetone, benzene, tuluene, xylene, petroleum ether, kerosene, carbon tetrochloride, methylene, chloride, and trichlorotrifluoroethane (i.e., freon 113, -tf-ta-tme). Recommended agents for interior cleaning are isopropyl alcohol or kelite (1 part kelite to 30 parts water). It is safe to use ethyl alcohol and methyl alcohol if the recommended solvents are not available.

4-9. Exterior Cleaning

4-10. Dirt accumulated on the exterior of the power supply may be removed with a soft cloth or a small paint brush damp ened with a mild detergent and water solution. Abrasive cleanser should never be used.

4-11. Lubrication

4-12. All adjustment potentiometers used in the Power Supply were installed with proper lubrication where necessary and will not require any additional lubrication. Thus, it is recommended that a regular periodic lubrication program not be performed on the Power Supplies. If the Power Supply is rack mounted using slide assemblies, periodic lubrication of the slide assemblies is recommended using a high temperature grease such as "Lubriplate".

4-13. Visual Inspection

4-14. Visually inspect the Power Supplies mechanical integrity for such items as loose plug-in PC Assemblies, lose or detached Cable Assemblies and modules for mechanical and thermal damage, ie. broken, bent, discolored or charred component parts.

4-15. The corrective procedure for most of the visible defects is obvious; however, particular care must be taken if thermal damage is noted. Overheating usually indicates other trouble in the module; therefore, it is imprtant that the cause of overheating be corrected to prevent possible recurrence of thermal damage to the replaced component.

4-16. Test Equipment Required

4-17. Table 4-1 lists the test equipment required to test and calibrate the QFP Series Power Supplies.

Table 4-1.
Recommended Test Equipment

Programming Source:	Maybe either the system controller or an off-line minicomputer or microcomputer with an IEEE bus port.
Programmer:	Model P-6 or P-12 with DAC cards installed.
Test Cable:	Wired as shown in Figure 4-1. The connector is ITT Cannon type KPT06-14-5P with the keying removed either by filing, grinding or turning on a lathe.
DVM:	5-1/2 digit or more, capable of reading from 1 μV to 200 V and calibrated to 0.01% accuracy or better on the 10 V and 200 V ranges.
Shunt:	100 A, 1 V, 0.1% or better accuracy. For calibration of the QFP100-1.5 or QFP200-.8, a 10 A 1 V, 0.1% accurate shunt is recommended.

Table 4-1. (Cont'd)
Recommended Test Equipment

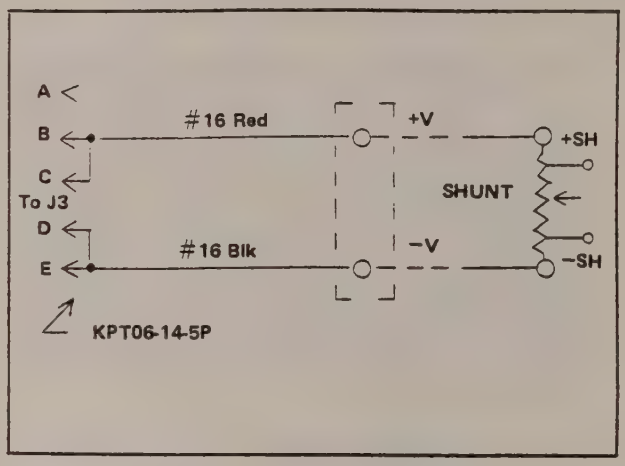


Figure 4-1. Test Cable

4-18. This procedure is for use in calibrating all members of the QFP Power Supply series. Calibration can be performed without removing the supplies from their rack adapters, it being only necessary to disconnect the normal output plug and substitute a test cable.

4-19. After initial calibration following installation in the System, the recommended interval for subsequent calibration is 6 months.

4-20. Calibration Procedure

4-21. With the output relay open, substitute the test cable for the normal output cable. Turn power ON and allow the unit to warm up for 20 minutes. Do not remove the top cover. To maintain interchangeability, the DAC board used as the input stimulus, should be in a calibrated condition. A good procedure would be to calibrate each DAC before calibrating the Supply.

4-22. V-ZERO Adjustment

1. Do not connect the shunt for this part of the procedure. Connect the DVM across the output leads +1 V. Reset the channel and close the output relay. Through the top cover, adjust R9 on the A1 Control Board for a reading of 0.000 ±0.001 V.

2. If the Supply has meters, check the mechanical zero of the voltmeter and adjust if necessary.

4-23. V-CAL Adjustment

1. Connect the DVM to test points TP1 and TP2 on the A1 Assembly. Set the channel voltage to full scale. Adjust A1R1 for a reading of -10.000 ±0.001 V.

4-24. Vn CAL Adjustment

1. Connect the DVM to the + and - sense leads. Adjust A1R28 for a full scale voltage reading.

2. For a metered Supply, check the voltmeter reading. It should be within 1% of the rated voltage. If not, adjust R102 at top behind the front panel.

4-25. Open the Supplies output relay. Connect the shunt to the test cable and the DVM to the metering taps on the shunt. Check the DVM zero and adjust to less than 2 μV.

4-26. I ZERO Adjustment

1. Set the current limit to zero and close the output. Adjust A1R15 for a reading of 0 ±1 mA. (Note: with a 0.01 ohm shunt, this is a voltage tolerance of ±10 μV.) If the higher resistance shunt (0.1 ohm) is used to test the QFP100-1.5 or QFP200-.8, then adjust A1R15 for a reading of 0 ±0.1 mA (Note: with a 0.1 ohm shunt, the voltage tolerance is still ±10 μV).

2. If the Supply has meters, check the mechanical zero of the ammeter. Adjust if necessary.

4-27. I CAL Adjustment

1. Set the current limit to the Supplies rated value. Adjust A1R12 for the correct reading on the DVM (Note: for a 4 A unit with a 0.01 ohm shunt, this would be a reading of 0.4000 ±0.00001 V).

2. For a metered Supply check the ammeter reading. It should be reading within 1% of the rated current. If not adjust R103 behind the front panel at the top.

3. Open and reset the Supply. Remove the test cable and reconnect the normal output connectors. This completes the calibration of the channel.

4-28. Service Alignment Procedure

4-29. Ths procedure is only necessary if the QFP Supplies are not meeting its load regulation specification. After performing this procedure, a routine calibration should be done.

4-30. All the equipment listed in Table 4-1 is needed except for the shunt. Also the DVM must have an input impedance of at least 1000 MΩ on the 10 V setting.

4-31. Calibration Procedure

4-32. With the output relay open, substitute the test cable for the normal output calbe. Turn power ON and allow the unit to warm up for 20 minutes. Remove the top cover. To maintain interchangeability, the DAC board used as the input stimulus, whould be in a calibrated condition. A good procedure would be to calibrate each DAC before calibrating the Supply.

4-33. For QFP models other than the QFP6-12, adjustment of bias voltage for the secondary rank of transistors may be

necessary. Connect the DVM to the cathode of A1CR2 (located on the lower right of the A1 Control Board) and TP1. Adjust A1R55 for a reading of 3.6 V.

4-34. V-ZERO Adjustment

1. Do not connect the shunt for this part of the procedure. Connect the DVM across the output leads +1 V. Reset the channel and close the output relay. Through the top cover sadjust R9 on the A1 Control Board for a reading of 0.000 ±0.001 V.

2. If the Supply has meters, check the mechanical zero of the voltmeter and adjust if necessary.

4-35. V-CAL Adjustment

1. Connect the DVM to test points TP1 and TP2 on the A1 Assembly. Set the channel voltage to full scale. Adjust A1R1 for a reading of -10.000 ±0.001 V.

4-36. -Vn BAL Adjustment

1. Connect the DVM to TP3 and TP1 on the A1 Assembly. Set the channel voltage to full scale. Adjust A1R34 for a voltage reading corresponding to the UUT (refer Table 4-2). The DVM must be on the 10 V range.

Table 4-2.
Voltage Readings

QFP	Voltage (±0.5 mV)
6-12	-3.7500
16-7	-6.1538
26-5	-7.2222
36-4	-7.8261
60-2.5	-8.5714
75-2	-8.8235
100-1.5	-9.0909
200-.8	-9.5238

4-37. Replace the top cover. This completes the service alignment procedure.

CHAPTER 5

REPLACEABLE PARTS

5-1. INTRODUCTION

5-2. This chapter contains the parts lists for each assembly in the QFP Series Power Supplies. Chapter 6 shows the assemblies where the listed parts are installed. Ordering information is included and should be used when purchasing parts from the factory. Explanation of the column listings and Table 5-1 Manufacturer's Code-To-Name Index are also included.

5-3. PART ORDERING INFORMATION

5-4. To order a part from the Replaceable Parts List, state the Systron Donner part number, indicate the quantity required and address the order to the nearest Systron Donner Sales or Service Center.

5-5. To order a part not listed in the Replaceable Parts List, state the instrument model number, instrument serial number, the description and function of the part and the number of parts required. Address the order to the nearest Systron Donner Sales or Service Center.

5-6. PARTS LISTS

5-7. The replaceable parts lists are placed in top breakdown assembly order. Each column provides specific information relating to the listed parts as follows:

(1) **FIND:** This is the find number column and list those numbers as called out on the respective assembly drawing.

(2) **SD STOCK NUMBER:** The Systron Donner part number is listed in this column.

(3) **COMPONENT NOMENCLATURE AND DESCRIPTION:** Component names and specifications are provided in this column and include value, tolerance, wattage rating, working voltage, construction, etc.

(4) **REFERENCE DESIGNATOR:** Reference designators applicable to assemblies/schematics are listed in alpha-numeric order.

(5) **QUANTITY:** This quantity, appearing after an item entry, indicates the number of times the component is used in that assembly.

(6) **MANUFACTURER'S CODE:** H4-2 Federal Supply Code numbers are listed to identify component manufacturers. A Manufacturers Code-To-Name Index is provided in this chapter for cross reference.

(7) **MANUFACTURER'S PART NUMBER:** True manufacturer part numbers are listed in this column.

Table 5-1. Manufacturer's Code-To-Name Index

Mfr. Code	Manufacturer Name	Address	Zip Code
01121	Allen Bradley Co.	Milwaukee, WI	53203
01295	Texas Instruments Inc. Semiconductor and Components Div.	Dallas, TX	75265
02660	Bunker Ramo Corp. Amphenol Div.	Broadview, IL	60153
03508	General Electric Co. Semiconductor Products Div.	Auburn, NY	13021
04222	AVX Ceramics Div.-AVX Corp.	Myrtle Beach, SC	29577
04713	Motorola Semiconducts Prod.Div.	Phoenix, AZ	85008
05574	Viking Connectors Inc.	Chatsworth, CA	91311
06383	Panduit Corp.	Tinley Park, IL	60477
06540	Mite Corp. Amatom Electronic Hardware Div.	New Haven, CT	06515
08289	Delbert Blinn Co. Inc.	Pomona, CA	91769
08547	R. G. Wallace Co. Inc.	Compton, CA	90220
09353	C and K Components Inc.	Newton, MA	02158
09922	Burndy Corp.	Norwalk, CT	06856
11237	CTS Keene Inc.	Paso Robles, CA	93446
13913	Western Reserve Electronics Inc.	Twinsburg, OH	44087
14726	Midland-Ross Corp, Cambion Div	Pompano Beach, FL	33060
15513	Data Display Products	Los Angeles, CA	90045
15636	Elec-Trol Inc.	Saugus, CA	91350
18324	Signetics Corp.	Sunnyvale, CA	94086
20932	Illinois Tool Works Inc. Emcom Div.	San Diego, CA	92121
24335	Cooper Laboratories Inc.	Wayne, NJ	07470
26066	Minnesota Mining and Mfg. Co. Industrial Tape Division	St. Paul, MN	55101
27014	National Semiconductors Corp.	Santa Clara, CA	95051
27264	Molex Inc.	Lisle, IL	60532
28480	Hewlett-Packard Co.	Palo Alto, CA	94304
28520	Heyman Mfg. Co.	Kenilworth, NJ	07033
30146	Symbex Corp. Subsidiary Asso.Enterprises	Painesville, OH	44077
34649	Intel Corp.	Santa Clara, CA	95051
52542	Systron Donner Corp. Instrument Div.	Concord, CA	94518
53387	Minnesota Mining and Mfg. Co. Electronic Products Division	St. Paul MN	55101
54453	Sullins Electronic Crop.	San Marcos, CA	92069
55210	Gettig Engineering and Mfr.	Spring Mill, PA	16875
56289	Sprague Electric Co.	North Adams, MA	01247
70903	Belden Corp.	Geneva, IL	60134
71279	Midland-Ross Corp. Cambridge Division	Cambridge, MA	02140
71468	ITT Cannon	Fountain Valley, CA	92708
73138	Beckman Instruments Inc. Helipot Div.	Fullerton, CA	92634
73803	Texas Instruments Inc.	Attleboro, MA	02703
74840	Illinois Capacitor Inc.	Lincolnwood, IL	60645

Table 5-1. Manufacturer's Code-To-Name Index (Cont'd)

Mfr. Code	Manufacturer Name	Address	Zip Code
75378	CTS Knights Inc.	Sandwich, IL	60548
75915	Tracor Littlefuse Inc.	Des Plaines, IL	60016
76381	Minnesota Mining and Mfg. Co.	St. Paul, MN	55101
78189	Illinois Tool Works Inc. Shakeproof Div.	Elgin, IL	60120
78553	Tinnerman Products Inc.	Cleveland, OH	44129
79963	Zierick Mfg. Co.	Mount Kisco, NY	10549
80205	National Aerospace Standard		
81349	MIL Specifications		
82389	Switchcraft Inc.	Chicago, IL	60630
82647	Texas Instruments Inc. Control Products Div.	Attleboro, MA	02703
86928	Seastrom Mfg. Co. Inc.	Glendale, CA	91201
88245	Litton Systems Inc. USECO Div.	Van Nuys, CA	91409
91506	Augat Inc.	Attleboro, MA	02703
91637	Dale Electronics Inc.	Columbus, NE	68601
91833	Keystone Electronics Corp.	New York, NY	10012
94222	Southco Inc.	Lester, PA	19113
95987	Weckesser Co. Inc.	Chicago, IL	60641
96733	San Fernando Electric Mfg. Co.	San Fernando, CA	91341
96906	MIL Specifications		
98159	Rubber Teck Inc.	Gardena, CA	90247
98921	O and M Mfg. Co.	Houston, TX	77029
99392	S T M Corp.	Oakland, CA	94601

QFP 26-5 POWER SUPPLY 10/02/85 07914603 B15497B 5/31/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079185	KIT SHPG QFP SERIES		1.000	52542	
0002	07914703	ASSY TEST QFP26-5		1.000	52542	
0003	FEATURE 079186	FEATURE 01 LINE V QFP SERIES		1.000	52542	
0004	FEATURE 07918703	FEATURE 02 METERS QFP26-5		1.000	52542	
0005	FEATURE 07918802	FEATURE 03 OUTPUT SWITCHING QF		1.000	52542	
0006	07905503	FOILCAL QFP26-5		1.000	52542	
0007	079146TAB	ASSY SHP IWG QFP SERIES	REF	.000	52542	
0010	907914603	ATP QFP26-5	REF	.000	52542	
0011	0079057	OUTLINE IWG QFP SERIES	REF	.000	52542	

SINGLE LEVEL EXPLOSION

QFP 36-4 POWER SUPPLY 10/02/85 07914604 B15497B 3/07/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079185	KIT SHPG QFP SERIES		1.000	52542	
0002	07914704	ASSY TEST QFP36-4		1.000	52542	
0003	FEATURE 079186	FEATURE 01 LINE V QFP SERIES		1.000	52542	
0004	FEATURE 07918704	FEATURE 02 METERS QFP36-4		1.000	52542	
0005	FEATURE 07918802	FEATURE 03 OUTPUT SWITCHING QF		1.000	52542	
0006	07905504	FOILCAL QFP36-4		1.000	52542	
0007	079146TAB	ASSY SHP IWG QFP SERIES	REF	.000	52542	
0010	907914604	ATP QFP36-4	REF	.000	52542	
0011	0079057	OUTLINE IWG QFP SERIES	REF	.000	52542	

SINGLE LEVEL EXPLOSION

KIT SHPG QFP SERIES 10/02/85 079185 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	102407	CORD ACPOWER 6.6 3-18 UL/CSA S		1.000	52542	102407
0002	079052	FAB TOP COVER QFP		1.000	52542	
0003	10063206	PHMS CRES 6-32 X 3/8		2.000		MS51957-28
0004	100647	INT TOOTH #6 CRES		2.000		MS35333-71
0005	100662	FLAT WSHR 6 .146 ID.270 OD CR		2.000	86928	5710-23-10
0006	10073106	PHMS CRES 6-32 X3/8		2.000		MS24693-C26

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079049	FAB CHASSIS QFP		1.000	52542	
0002	840192	FEET RUBBER #2095	REF	.000	52542	
0003	101288	CONN POWERMALE CH RECEPT AC W/	J1	1.000	82389	EAC-301
0004	07916601	ASSY FAN QFP-SERIES	B1	1.000	52542	
0005	10064206	PHMS CRES 8-32 X 3/8	REF	.000		MS51957-43
0006	504373	XFMR POWER QFP26-5	T1	1.000	52542	504373-51
0007	117655	DIODE RECTMDA2502 200V 25A BRI	CR1	1.000	04713	MDA2502
0008	079046	FAB BRKT CAPACITOR QFP		1.000	52542	
0009	100074	CAP C DISC.05 UF 600V +80-20%	C1,2	2.000	91418	TYPE B
0010	123293	CAP EL CAN 20000UF 30V 2*3.12	C3,4	2.000	52542	123293
0012	101747	RES CC 2W 1.0K 5%	R1,2	2.000	01121	HB1025
0013	07921902	ASSY CABLE OUTPUT QFP26,36		1.000	52542	
0014	07915403	ASSY TOP HEATSINK QFP26-5		1.000	52542	
0015	10074304	PHMS CRES 8-32X1/4		2.000		MS24693-C46
0016	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD
0017	100940	NUT KEP 8-32 .3750D .16THK C		6.000	78189	511-081800-00
0018	100705	FLAT WSHR 8 .187 ID.375 OD CR		5.000		MS15795-807
0019	112472	NUT 6-32, KEP		8.000	78189	511-061800-01
0020	10073108	PHMS CRES 6-32X1/2		1.000		MS24693-C28
0021	10063204	PHMS CRES 6-32X1/4		4.000		MS51957-26
0022	100647	INT TOOTH #6 CRES		8.000		MS35333-71
0023	100015	SPACER 6X1/8LX1/4RND BRASS CAD		1.000	83330	8701
0025	100704	FLAT WSHR 6 .156 ID.312 OD CR		4.000		MS15795-805
0026	10064406	PHMS CRES 10-32 X 3/8		4.000		MS51958-61
0027	100989	LUG SOLDER #10INT TOOTH.69L2		4.000	78189	2104-10-00
0028	079165	FAB BUS BAR		1.000	52542	
0029	100945	SPCR THRDD4-40 3/8L X 1/4 RND		1.000	83330	8322-A-0256
0030	10062606	PHMS CRES 4-40X3/8		6.000		MS51957-15
0031	102944	NUT SPEED 6-32 .050-.062MAT .3		1.000	70553	C1087-632-4
0032	100851	PHMS CRES 6-32 X 9/16 PHILLIPS		3.000	08547	BY DESCRIPTION
0033	06585602	ASSY CABLE RIBBON QFP SERIES		1.000	52542	
0034	10062607	PHMS CRES 4-40X7/16		2.000		MS51957-16
0035	100683	FLAT WSHR 4 .115 ID.210 OD ST		4.000		NAS620-42
0036	100941	NUT KEP 4-40 .2810D .11THK C		4.000	78189	511-041800-00
0037	11983001	BUSHING SNAP NYLON .187 OD.375		1.000	28520	2020/SB-375-3
0040	06582908	ASSY PCB CONTROL QFP26-5		1.000	52542	
0042	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0043	100794	INT TOOTH #4 CRES		2.000		MS35333-70
0044	10063210	PHMS CRES 6-32X5/8		2.000		MS51957-31
0046	07916101	ASSY CABLE P2-P4 QFP		1.000	52542	
0047	PHANTOM 507916201	W/L LOOSE CHASSIS QFP		1.000	52542	
0049	079198	FOILCAL MODEL & SERIAL NO.		1.000	52542	
0050	11981701	CON LATCH SPRING	REF	.000	71468	D110277
0051	079169	FAB INSULATOR CAP BRKT QFP		1.000	52542	
0052	079056	FAB PCB SUPPORT		1.000	52542	
0060	707905803	SCHEM QFP26-5	REF	.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079049	FAB CHASSIS QFP		1.000	52542	
0002	840192	FEET RUBBER #2095	REF	.000	52542	
0003	101208	CONN POWERMALE CII RECEPT AC W/	J1	1.000	82389	EAC-301
0004	07916601	ASSY FAN QFP-SERIES	B1	1.000	52542	
0005	10064206	PHMS CRES 8-32 X 3/8	REF	.000		MS51957-43
0006	504374	XFMR POWER QFP36-4	T1	1.000	52542	504374-51
0007	117655	DIODE RECTMDA2502 200V 25A BRI	CR1	1.000	04713	MDA2502
0008	079046	FAB BRKT CAPACITOR QFP		1.000	52542	
0009	100074	CAP C DISC.05 UF 600V +80-20%	C1,2	2.000	91418	TYPE B
0010	123292	CAP EL CAN 15000UF 35V 2*3.12	C3,4	2.000		EMC153CG35S
0012	630420	RES WW PWR1.5K 3W 3% <20PPM/C	R1,2	2.000	15915	TS2C
0013	07921902	ASSY CABLE OUTPUT QFP26,36		1.000	52542	
0014	07915404	ASSY TOP HEATSINK QFP36-4		1.000	52542	
0015	10074304	PHMS CRES 8-32X1/4		2.000		MS24693-C46
0017	100940	NUT KEP 8-32 .3750D .16THK C		6.000	78189	511-081800-00
0018	100705	FLAT WSHR 8 .187 ID.375 OD CR		5.000		MS15795-807
0019	112472	NUT 6-32, KEP		8.000	78189	511-061800-01
0020	10073108	PHMS CRES 6-32X1/2		1.000		MS24693-C28
0021	10063204	PHMS CRES 6-32X1/4		4.000		MS51957-26
0022	100647	INT TOOTH #6 CRES		8.000		MS35333-71
0023	100015	SPACER 6X1/8LX1/4RND BRASS CAD		1.000	83330	8701
0025	100704	FLAT WSHR 6 .156 ID.312 OD CR		4.000		MS15795-805
0026	10064406	PHMS CRES 10-32 X 3/8		4.000		MS51958-61
0027	100989	LUG SOLDER #10INT TOOTH.69L2		4.000	78189	2104-10-00
0028	079165	FAB BUS BAR		1.000	52542	
0029	100945	SPCR THRD4-40 3/8L X 1/4 RND		1.000	83330	8322-A-0256
0030	10062606	PHMS CRES 4-40X3/8		6.000		MS51957-15
0031	102944	NUT SPEED 6-32 .050-.062MAT .3		1.000	78553	C1887-632-4
0032	100851	PHMS CRES 6-32 X 9/16 PHILLIPS		3.000	08547	BY DESCRIPTION
0033	06585602	ASSY CABLE RIBBON QFP SERIES		1.000	52542	
0034	10062607	PHMS CRES 4-40X7/16		2.000		MS51957-16
0035	100683	FLAT WSHR 4 .115 ID.210 OD ST		4.000		NAS620-42
0036	100941	NUT KEP 4-40 .2810D .11THK C		4.000	78189	511-041800-00
0037	11983001	BUSHING SNAP NYLON .187 OD.375		1.000	28520	2020/SB-375-3
0040	06582909	ASSY PCB CONTROL QFP36-4		1.000	52542	
0042	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0043	100794	INT TOOTH #4 CRES		2.000		MS35333-70
0044	10063210	PHMS CRES 6-32X5/8		2.000		MS51957-31
0046	07916101	ASSY CABLE P2-P4 QFP		1.000	52542	
0047	PHANTOM 507916201	W/L LOOSE CHASSIS QFP		1.000	52542	
0049	079198	FOILCAL MODEL & SERIAL NO.		1.000	52542	
0050	11981701	CON LATCH SPRING	REF	.000	71468	D110277
0051	079169	FAB INSULATOR CAP BRKT QFP		1.000	52542	
0052	079056	FAB PCB SUPPORT		1.000	52542	
0060	707905804	SCHEM QFP36-4	REF	.000	52542	

SINGLE LEVEL EXPLOSION

ASSY FAN QFP-SERIES 10/02/85 07916601 A------A 5/09/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	100038	FAN 50-60HZ 3.12 SQ 34CFM		1.000	92702	AS115AAAS
0002	079153	FAB BAFFLE FAN QFP		1.000	52542	
0003	079164	FAB BAFFLE PLATE		1.000	52542	
0004	10062604	FHMS CRES 4-40 X 1/4		4.000		MS51957-13
0005	10072003	FHMS CRES 4-40X3/16		2.000		MS24693-C1
0006	123298	NUT SPEED 4-40 .043X.049MAT		6.000	78553	C11374-440-24

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11769602	CONN CIRC 5SKT RCPT X-KEY	J3	1.000	71468	KPT00A-14-5S-X
0002	100178	CAP CER DP .1UF 50V 20% Z5U .3	C7	1.000	56289	2C37Z5U104M050B
0003	11958401	CON RTNGLR 3POS RECEPT SHELL	P5	1.000	27264	22-01-3037
0004	11958201	CONN TERM SKT 22-30 CRIMP AU D		3.000	27264	08-56-0110
0005	123095	TERMINAL RING 10 CRMP 22-16 RE		2.000	14726	R4149SFT
0007	123353	TERMINAL SLIPON CRMP 22-18 RED		1.000	14726	S096156FT
0008	123281	TERMINAL SLIPON CRMP 22-18RED		1.000	14726	S096175SF
0009	PHANTOM 507921902	W/L CABLE OUTPUT QFP26,36		1.000	52542	
0010	079219TAB	ASSY CABLE OUTPUT DWG	REF	.000	52542	SD

SINGLE LEVEL EXPLOSION

ASSY TOP HEATSINK QFP26-5 10/02/85 07915403 A------A 5/31/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 07916801	ASSY CABLE HS HINGED		1.000	52542	
0002	07904303	ASSY HS RIGHT HINGED QFP26-5		1.000	52542	
0003	07904403	ASSY HEATSINK & SUPPORT QFP26		1.000	52542	
0004	07915503	ASSY SHUNT QFP26,36 .053 OHM	R9	1.000	52542	
0007	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0008	100794	INT TOOTH #4 CRES		5.000		MS35333-70
0009	100703	FLAT WSHR 4 .125 ID.250 OD CR		3.000		MS15795-803
0010	07915902	ASSY CABLE HS - J4 QFP		1.000	52542	

SINGLE LEVEL EXPLOSION

ASSY TOP HEATSINK QFP36-4 10/02/85 07915404 A------A 4/01/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0002	07904304	ASSY HS RIGHT HINGED		1.000	52542	
0003	07904404	ASSY HEATSINK & SUPPORT		1.000	52542	
0004	07915503	ASSY SHUNT QFP26,36 .053 OHM	R9	1.000	52542	
0006	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0007	10062604	PHMS CRES 4-40 X 1/4		5.000		MS51957-13
0008	100794	INT TOOTH #4 CRES		5.000		MS35333-70
0009	100703	FLAT WSHR 4 .125 ID.250 OD CR		5.000		MS15795-803
0010	07915902	ASSY CABLE HS - J4 QFP		1.000	52542	

SINGLE LEVEL EXPLOSION

ASSY HS RIGHT HINGED QFP26-5 10/02/85 07904303 A------A 5/31/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079043	FAB HEATSINK RIGHT QFP		1.000	52542	
0002	123287	XSTR SINPN 2N6284 DARL TO03 10	Q1,3	2.000	04713	2N6284
0003	630029	RES WW PWR.15 5W 3% (90PPM/C(.	R3,5	2.000	12463	T-5
0004	117568	CAP CER DP1000PF 100V 10% X7R	C5	1.000	04222	3418100C102K
0005	860020	TERM SCRMT4-40 INSL .38HI BIFU		2.000	17117	2304-14-1
0006	10072005	SCREW 4-40X5/16 FHM CRES		2.000		MS24693-C3
0007	100794	INT TOOTH #4 CRES		3.000		MS35333-70
0008	100624	SH MET SCR6X1/2 PH TYPB		4.000	73734	MS24621-1B
0009	100647	INT TOOTH #6 CRES		4.000		MS35333-71
0010	830101	SOCKT XSTR TO-3 NYLON TOP PLAT		2.000	22753	PTS-2
0011	103358	INS XISTORTO-3 MICA.05LD.14MT		2.000	08289	DM-111
0012	102835	BRKT,ANGLE3/8WX25/64LX29/64L14		1.000	79963	293 STD
0013	10062604	PHMS CRES 4-40 X 1/4		1.000		MS51957-13

SINGLE LEVEL EXPLOSION

ASSY HS RIGHT HINGED 10/02/85 07904304 A------A 4/01/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079043	FAB HEATSINK RIGHT QFP		1.000	52542	
0002	123287	XSTR SINPN 2N6284 DARL TO03 10	Q1,3	2.000	04713	2N6284
0003	630004	RES WW PWR.2 3W 3% 100PPM	R3,5	2.000	15915	TS 2C
0004	117568	CAP CER DP1000PF 100V 10% X7R	C5	1.000	04222	3418100C102K
0005	860020	TERM SCRMT4-40 INSL .38HI BIFU		2.000	17117	2304-14-1
0006	10062605	PHMS CRES 4-40 X 5/16		2.000		MS51957-14
0007	100794	INT TOOTH #4 CRES		3.000		MS35333-70
0008	100624	SH MET SCR6X1/2 PH TYPB		4.000	73734	MS24621-1B
0009	100647	INT TOOTH #6 CRES		4.000		MS35333-71
0010	830101	SOCKT XSTR TO-3 NYLON TOP PLAT		2.000	22753	PTS-2
0011	103358	INS XISTORTO-3 MICA.05LD.14MT		2.000	08289	DM-111
0012	102835	BRKT,ANGLE3/8WX25/64LX29/64L14		1.000	79963	293 STD
0013	10062604	PHMS CRES 4-40 X 1/4		1.000		MS51957-13
0014	PHANTOM 07916801	ASSY CABLE HS HINGED		1.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079044	FAB HEATSINK LEFT QFP		1.000	52542	
0002	123287	XSTR SINPN 2N6284 DARL TO03 10	Q2,4	2.000	04713	2N6284
0003	630029	RES WW PWR.15 5W 3% <90PPM/C<.	R4,6	2.000	12463	T-5
0004	720132	DIODE RECTIN1200A-MR1121 100V	CR2,4	2.000	04713	MR1121
0005	06585701	SW THERMAL NO CLOSE 131C+-4C	S1	1.000	52542	
0006	860020	TERM SCRMT4-40 INSL .38HI BIFU		4.000	17117	2304-14-1
0007	10062605	PHMS CRES 4-40 X 5/16		2.000		MS51957-14
0008	100794	INT TOOTH #4 CRES		4.000		MS35333-70
0009	100624	SH MET SCR6X1/2 PH TYPB		6.000	73734	MS24621-18
0010	100647	INT TOOTH #6 CRES		9.000		MS35333-71
0011	100709	NUT HES #10-32		2.000		MS35650-104
0012	100698	WASHER INT LOCK #10		2.000		MS35333-73
0013	100648	FLAT WSHR 10 .218 ID.437 OD CR		2.000		MS15795-808
0014	12306201	INSUL RING .197ID.2800D.050THK		2.000	86928	5612-62-50
0015	101067	MICA WASHER.192ID.6250D.005THK		4.000	86928	5624-9-5
0016	123060	LUG SOLDER.196MTG.81L.120HOLE		2.000	06540	20209#10
0017	830101	SOCKT XSTR TO-3 NYLON TOP PLAT		3.000	22753	PTS-2
0018	103358	INS XISTORTO-3 MICA.05LD.14MT		3.000	08289	DM-111
0019	079045	FAB PLATE SUPPORT HS QFP		1.000	52542	
0020	116604	SCR 2N3896 35A 100A TO-48 MOD	CR3	1.000	04713	2N3896
0021	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0022	123288	MOSFET NCH IRF133 60V RDS<.25	Q5	1.000	04713	IRF133
0023	123086	LUG SOLDER .255ID 1.125L 1HOLE		1.000	86928	5411-35
0024	123087	MICA WSHR 1.00D .250ID .002T		2.000	86928	5624-72-2
0025	123088	INSL XTR .3730D .283ID .051T		1.000	86928	5612-80-50
0026	106987	FLAT WSHR .265ID#.50		1.000		AN960-416L
0027	103004	INT TOOTH .261 ID.402 OD CPS		1.000	78189	1214-05
0028	123090	NUT HEX 1/4-28 .43AF .156T CDP		1.000		BY DESCRIPTION
0029	079157	FAB HINGE QFP		1.000	52542	
0030	10072004	PHMS CRES 4-40X1/4		2.000		MS24693-C2
0031	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0032	10063208	PHMS CRES 6-32 X 1/2		2.000		MS51957-30
0033	103413	RES WW PWR.51 5% 2W	R8	1.000	75042	BWH
0034	101569	RES CC1/4W1.0K 5%	R7	1.000	01121	CB1025
0035	117764	SPACER M-F6-32 5/8L .25L MALE		1.000	06540	9740-SS-0632
0036	106447	CAP EL AX 35UF 50V 3/8X11/4L	C6	1.000	56289	TE1306
0037	10062504	PHMS CRES 2-56 X 1/4		2.000		MS51957-3
0038	100701	INT TOOTH #2 CRES		2.000		MS35333-69
0039	100704	FLAT WSHR 6 .156 ID.312 OD CR		1.000		MS15795-805
0040	112610	NYL WSHR FLT6.150ID.3120D.062T		1.000	86928	5610-44-62

SINGLE LEVEL EXPLOSION

ASSY HEATSINK & SUPPORT 10/02/85 07904404 A------A 4/01/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079044	FAB HEATSINK LEFT QFP		1.000	52542	
0002	123287	XSTR SINPN 2N6284 DARL TO03 10	Q2,4	2.000	04713	2N6284
0003	630004	RES WW PWR.2 3W 3% 100PPM	R4,6	2.000	15915	TS 2C
0004	720132	DIODE RECTIN1200A-MR1121 100V	CR2,4	2.000	04713	MR1121
0005	06585701	SW THERMAL NO CLOSE 131C+-4C	S1	1.000	52542	
0006	860020	TERM SCRMT4-40 INSL .38HI BIFU		4.000	17117	2304-14-1
0007	10062605	PHMS CRES 4-40 X 5/16		2.000		MS51957-14
0008	100794	INT TOOTH #4 CRES		4.000		MS35333-70
0009	100624	SH MET SCR6X1/2 PH TYPB		6.000	73734	MS24621-18
0010	100647	INT TOOTH #6 CRES		9.000		MS35333-71
0011	100709	NUT HES #10-32		2.000		MS35650-104
0012	100698	WASHER INT LOCK #10		2.000		MS35333-73
0013	100648	FLAT WSHR 10 .218 ID.437 OD CR		2.000		MS15795-808
0014	12306201	INSUL RING .197ID.2800D.050THK		2.000	86928	5612-62-50
0015	101067	MICA WASHER.192ID.6250D.005THK		4.000	86928	5624-9-5
0016	123060	LUG SOLDER.196MTG.81L.120HOLE		2.000	06540	20209#10
0017	830101	SOCKT XSTR TO-3 NYLON TOP FLAT		3.000	22753	FIS-2
0018	103358	INS XISTORTO-3 MICA.05LD.14MT		3.000	08289	DM-111
0019	079045	FAB PLATE SUPPORT HS QFP		1.000	52542	
0020	116604	SCR 2N3896 35A 100A TO-48 MOD	CR3	1.000	04713	2N3896
0021	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0022	123288	MOSFET NCH IRF133 60V RDS(.25	Q5	1.000	04713	IRF133
0023	123086	LUG SOLDER .255ID 1.125L 1HOLE		1.000	86928	5411-35
0024	123087	MICA WSHR 1.00D .250ID .002T		2.000	86928	5624-72-2
0025	123088	INSL XTR .373OD .283ID .051T		1.000	86928	5612-80-50
0026	106987	FLAT WSHR .265ID*.50		1.000		AN960-416L
0027	103004	INT TOOTH .261 ID.402 OD CPS		1.000	78189	1214-05
0028	123090	NUT HEX 1/4-28 .43AF .156T CDP		1.000		BY DESCRIPTION
0029	079157	FAB HINGE QFP		1.000	52542	
0030	10072004	PHMS CRES 4-40X1/4		2.000		MS24693-C2
0031	100941	NUT KEP 4-40 .281OD .11THK C		2.000	78189	511-041800-00
0032	10063208	PHMS CRES 6-32 X 1/2		2.000		MS51957-30
0033	630020	RES WW PWR.7 3W 3% (90PPM/C .2	R8	1.000	15915	TS-2C
0034	101569	RES CC1/4W1.0K 5%	R7	1.000	01121	CB1025
0035	117764	SPACER M-F6-32 5/8L .25L MALE		1.000	06540	9740-SS-0632
0036	810040	CAP EL AX 20UF 100V .385 X 1.2	C6	1.000	56289	TE-1409
0037	10062504	PHMS CRES 2-56 X 1/4		2.000		MS51957-3
0038	100701	INT TOOTH #2 CRES		2.000		MS35333-69
0039	100704	FLAT WSHR 6 .156 ID.312 OD CR		1.000		MS15795-805
0040	112610	NYL WSHR FLT6.150ID.312OD.062T		1.000	86928	5610-44-62

SINGLE LEVEL EXPLOSION

ASSY SHUNT QFP26,36 .053 OHM 10/02/85 07915503 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079148	FAB SHUNT SUPPORT LEFT QFP		1.000	52542	
0002	079149	FAB SHUNT SUPPORT RIGHT QFP		1.000	52542	
0003	079156	FAB SHUNT GUIDE QFP		2.000	52542	
0004	07910203	FAB SHUNT .053 OHM		1.000	52542	
0005	116907	TH CUT SCR 4-40 X 1/4 TYPEF		4.000	73734	BY DESCRIPTION
0007	116237	WSHR FLAT 4 .125ID .312OD CRES		2.000		MS15795-804
0008	10062608	FHMS CRES 4-40X1/2		2.000		MS51957-17
0009	100941	NUT KEP 4-40 .281OD .11THK C		2.000	78189	511-041800-00

SINGLE LEVEL EXPLOSION

ASSY CABLE HS - J4 OFF 10/02/85 07915902 A-------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	101284	CONTACT PCEDGE CONN 18-22AWG		15.000	00779	530006-3
0002	11965801	WIRE TERMN SKT .110 PUSHON CRI		3.000	79963	875-6
0003	123097	TERMINAL RING 6 CRMP 22-16 RED		4.000	14726	R4147SFT
0004	123501	LUG SPADE FLRED CR1MP 22-16RED		3.000	14726	SF20754SF
0005	123353	TERMINAL SLIPON CRMP 22-18 RED		1.000	14726	S09615SFT
0006	101285	CON PC EDG22 POS SHELL LESS CO	J4	1.000	00779	582388-9
0007	507915902	W/L CABLE HS-J4 OFF		1.000	52542	
0008	079159TAB	ASSY CABLE HS-J4 OFF SERIES	REF	.000	52542	

SINGLE LEVEL EXPLOSION

ASSY CABLE RIBBON OFF SERIES 10/02/85 06585602 A-------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0002	11991101	CBL FLAT 25COND 28GA PVC 1.25W		1.000	76381	3365/25
0003	11981401	CON RTNGL 25SKT D .05 FLAT CBL	J2	1.000	02660	841-17-DBFR-1025G
0004	11941301	CON RTNGLR 24 PIN DIP PLUG		1.000	53387	3460-0000T
0005	11981701	CON LATCH SPRING		1.000	71468	D110277
0006	10062606	PHMS CRES 4-40X3/8		2.000		MS51957-15
0007	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	065829	FAB PCB CONTROL		1.000	52542	
0002	065829TAB	ASSY PCB CONTROL HRP/QFP	REF	.000	52542	
0003	840420	XSTR MT PDTO-5 .355OD .038THK		3.000	07047	10079 DAP
0004	100492	SPCR SWAGE4-40 .125L X.25RND .		2.000	71279	1300-9
0005	103383	CAP EL AX 470UF-10/+50% 35V .5	C1	1.000	74840	477TTA35A
0006	11982401	CAP EL AX 220UF 35V -20/75% (.	C2	1.000	74840	227TTA035A
0007	100211	CAP TANT 15UF 20V 10%	C3	1.000	56289	150D156X9020B2
0008	100176	CAP CER DP 1UF 50V 20% Z5U .3B	C4-6,10	4.000	56289	2C37Z5U105M050B
0011	117621	CAP CER DP10PF 100V 5% COG .1L	C7	1.000	96773	DB44BY100J
0012	100168	CAP MYLAR .01UF 200V 10%	C8,9	2.000	56289	192P10392
0015	11979801	CAP CER DP .033UF 50V 10% X7R	C11	1.000	71590	CW20C333K
0016	11979701	CAP CER DP .022UF 50V 10% X7R	C12	1.000	71590	CW20C223K
0017	117636	CAP CER DP330PF 100V 5% COG .1	C13	1.000	96733	DB45BY331J
0018	117640	CAP CER DP27PF 100V 5% COG .1L	C14	1.000	96733	DB44BY270J
0019	99REF50	*** REF DESN'TORS NOT USED ***	C15	.000		
0020	116501	CAP CER DP2200PF 100V 10% X7R	C16	1.000	96733	DB44BX222K
0021	117637	CAP CER DP470PF 100V 5% COG .1	C17	1.000	96733	DB45BY471J
0022	99REF50	*** REF DESN'TORS NOT USED ***	C18	.000		
0023	100178	CAP CER DP .1UF 50V 20% Z5U .3	C19,24	3.000	56289	2C37Z5U104M050B
0023	99REF01	REF DESN'TORS CONT FROM ABOVE	C25	.000		
0024	99REF50	*** REF DESN'TORS NOT USED ***	C20-23	.000		
0030	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0031	100426	DIODE SGNL1N459A 175V	CR2,3	2.000	13715	1N459A
0033	100383	DIODE ZENR 15V 5% .4W 1N965B	CR4	1.000	04713	1N965B
0034	100385	DIODE SGNL1N4151 50V	CR5,6,8	23.000	03508	1N4151
0034	99REF01	REF DESN'TORS CONT FROM ABOVE	9,12-30	.000		
0036	100416	DIODE ZENR6.8V 5% .4W 1N957B	CR7	1.000	04713	1N957B
0039	100395	DIODE ZENR 10V 5% .4W 1N961B	CR10	1.000	04713	1N961B
0040	102879	JUMPER, 22AWG INSULATED .09D	CR11,32	3.000	55210	L-2007-1
0040	99REF01	REF DESN'TORS CONT FROM ABOVE	CR33	.000		
0060	100390	DIODE ZENR 12V 5% .4W 1N963B	CR31	1.000	04713	1N963B
0063	100404	DIODE ZENR 18V 5% .4W 1N967B	CR34	1.000	04713	1N967B
0064	99REF50	*** REF DESN'TORS NOT USED ***	CR35	.000		
0065	123100	DIODE REF 1.23V 2% LM385Z-1.2	CR36,37	2.000	27014	LM385Z-1.2
0066	11933801	SOCKET DIL 24 PCMT .6SP .18HI	J1	1.000		524-AG11D
0067	11973201	CON PC 12 PIN RTANG HDR .1C-C	J2	1.000	27264	22-12-2124
0068	11981001	CON PC 8 PIN RTANG HDR .1C-C F	J3	1.000	27264	22-12-2084
0069	101376	XSTR SINPN2N2219	Q1	1.000	07263	2N2219
0070	700179	XSTR SIPNPMPS-A92 300V 30B150@	Q2	1.000	04713	MPS-A92
0071	705067	XSTR SIPNP2N2905A 60V 100B300@	Q3,4	2.000		2N2905AS
0073	101378	XSTR SIPNP2N3906 40V 100B300@1	Q5	1.000	04713	2N3906
0074	101377	XSTR SINPN2N3904 40V 100B300@1	Q6	1.000	04713	2N3904
0075	102183	POT 15T PC500 10% 3/8W CERM E	R1	1.000	73138	89PR500
0076	119007	RES MF 4.87K .1W 1% 25PPM/C	R2,3	2.000	91637	CMF-55 T9
0078	119041	RES, 10.0K, 1% MF	R4,14	2.000	91637	CMF-55 T9
0079	117576	RES MF 4.99K .1 W 1% 100PPM	R5	1.000		C-RN55D4991F
0080	101564	RES CC1/4W 10M 5%	R8	1.000	01121	CB1065

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0081	101559	RES CC1/4W3.3K 5%	R7	1.000	01121	CB3325
0082	106002	RES CC1/4W2.4M 5%	R8	1.000	01121	CB2455
0083	102470	POT 15T PC 20K 10% 3/8W CERM E	R9	1.000	73138	89PR20K
0084	101608	RES CC1/4W6.2K 5%	R10,17	2.000	01121	CB6225
0085	99REF50	*** REF DESN'TORS NOT USED ***	R11	.000		
0086	102154	POT 15T PC 20 20% 3/8W CERM E	R12	1.000	73138	89PR20
0087	103018	RES MF 255 .12W 1% 25PP	R13	1.000	91637	MFF 1/8 T9
0089	102472	POT 15T PC 10K 10% 3/8W CERM E	R15	1.000	73138	89PR10K
0090	101569	RES CC1/4W1.0K 5%	R16,20	2.000	01121	CB1025
0092	101572	RES CC1/4W 22K 5%	R18	1.000	01121	CB2235
0093	101537	RES CC1/4W300 OHMS 5%	R19	1.000	01121	CB3015
0095	101887	RES CC1/4W7.5 OHMS 5%	R21	1.000	01121	CB7505
0096	101570	RES CC1/4W 10K 5%	R22,24	5.000	01121	CB1035
0096	99REF01	REF DESN'TORS CONT FROM ABOVE	38,68,70	.000		
0097	101569	RES CC1/4W1.0K 5%	R23,57	2.000	01121	CB1025
0099	101689	RES CC1/4W750 OHMS 5%	R25	1.000	01121	CB7515
0100	119079	RES MF 23.7K .1W 1% 25PPM/C	R26	1.000	91637	CMF-55 T9
0101	118044	RES MF 10.0K .1W .1% 5PPM/C	R27	1.000	60393	PR1/10 10K.1%T5
0102	102119	POT 15T PC 2K 10% 3/8W CERM E	R28,34	2.000	73138	89PR2K
0103	119084	RES MF 25.5K .1W 1% 25PPM/C	R29	1.000	91637	CMF-55 T9
0104	119127	RES MF 66.5K .1W 1% 25PPM/C	R30	1.000	91637	CMF-55 T9
0105	630420	RES WW PWR1.5K 3W 3% <20PPM/C	R31,69	2.000	15915	1S2C
0107	99REF50	*** REF DESN'TORS NOT USED ***	R32,33	.000		
0109	99REF50	*** REF DESN'TORS NOT USED ***	R35	.000		
0110	106363	RES MF 10.0K .12W .1% 50PPM	R36	1.000	14298	EE-1/8 RN60C
0111	11980401	RES MF 11.0K .1W .1% 50PPM/C	R37	1.000		C-RN55C1102B
0113	101577	RES CC1/4W1.5K 5%	R39	1.000	01121	CB1525
0114	101567	RES CC1/4W820 OHMS 5%	R40	1.000	01121	CB8215
0115	119091	RES MF 29.4K .1W 1% 2	R41	1.000	91637	CMF-55 T9
0116	117818	RES MF 4990HMS.1 W 1% 100 PPM	R42	1.000		C-RN55D4990F
0117	101552	RES CC1/4W 15K 5%	R43	1.000	01121	CB1535
0118	101549	RES CC1/4W 30K 5%	R44,45	2.000	01121	CB3035
0120	101554	RES CC1/4W 24K 5%	R46-48	5.000	01121	CB2435
0120	99REF01	REF DESN'TORS CONT FROM ABOVE	R60,61	.000		
0123	101576	RES CC1/4W 33K 5%	R49,50	3.000	01121	CB3335
0123	99REF01	REF DESN'TORS CONT FROM ABOVE	R62	.000		
0125	101589	RES CC1/4W1.1K 5%	R51-53	3.000	01121	CB1125
0128	101581	RES CC1/4W1.2K 5%	R54,63	2.000	01121	CB1225
0129	103391	POT 18T PC 2K 10% .5W CRMT TO	R55	1.000	73138	68WR2K
0130	101588	RES CC1/4W240 OHMS 5%	R563	1.000	01121	CB2415
0132	99REF50	*** REF DESN'TORS NOT USED ***	R58,59	.000		
0138	101609	RES CC1/4W100 OHMS 5%	R64	1.000	01121	CB1015
0139	101498	RES CC1/2W100 OHMS 5%	R65	1.000	01121	EB1015
0140	101755	RES CC1/4W430K 5%	R66	1.000	01121	CB4345
0141	101684	RES CC1/4W1.2M 5%	R67	1.000	01121	CB1255
0145	100521	TEST POINTBROWN PC MT PARALLE	TP1	1.000	91506	8041-103
0146	100522	TEST POINTRED PC MT PARALLE	TP2	1.000	91506	8041-104

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0147	123103	TERM SWAGE TUB NO.062MAT.37HI.	TP3	1.000	91833	1540-2
0149	025758	IC OP AMP LM201A A94DB IB75NA	U1	1.000	27014	LM201AH
0150	11982801	IC OP AMP LF412 JFET DUAL A>88	U2	1.000	27014	LF412CH
0151	11783801	IC OP AMP AD542JH JFET A100DB	U3	1.000	24335	AD542JH
0152	11982701	IC OP AMP LF411 JFET A>88DB IB	U4	1.000	27014	LF411CH
0153	102858	OPTOISOLTR CT6 DUAL IC/IF .2MI	U5,6	2.000	50522	MCT6
0155	103039	IC VOLTREG7815 15V 5%,1A,15W-.	U7	1.000	04713	MC7815CT
0156	11980701	IC VOLTREG MC7906CT -6V 5% 1A	U8	1.000	04713	MC7906CT
0157	117261	IC VOLTREG79L15 -15.6/14.4V .0	U9	1.000	04713	MC79L15ACP
0158	11980801	IC VOLTREG LM317LZ 37-2V@.1A	U10	1.000	27014	LM317LZ
0159	11980901	IC CMOS 14584 HEX SCHMITT TRIG	U11	1.000	04713	MC14584BCP
0160	103217	IC CMOS 4049 HEX INV BUFF LT	U12	1.000	02735	MC14049BCP
0161	106621	IC OP AMP 741C A86DB IB.5VA 8D	U13	1.000	07263	741TC
0163	102879	JUMPER, 22AWG INSULATED .09D	W1,2,6	3.000	55210	L-2007-1
0165	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0166	100794	INT TOOTH #4 CRES		2.000		MS35333-70
0167	99REF50	*** REF DESN'TORS NOT USED ***	W3-5	.000		
0168	99REF50	*** REF DESN'TORS NOT USED ***	W7-12	.000		
0180	707905803	SCHEM QFP26-5	REF	.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	065829	FAB PCB CONTROL		1.000	52542	
0002	065829TAB	ASSY PCB CONTROL HRP/QFP	REF	.000	52542	
0003	840420	XSTR MT PDTO-5 .355OD .038THK		3.000	07047	10079 DAF
0004	100492	SPCR SWAGE4-40 .125L X.25RND .		2.000	71279	1300-9
0005	103383	CAP EL AX 470UF-10/+50% 35V .5	C1	1.000	74840	477TTA35A
0006	11982401	CAP EL AX 220UF 35V -20/75% (.	C2	1.000	74840	227TTA035A
0007	100211	CAP TANT 15UF 20V 10%	C3	1.000	56289	150D156X9020B2
0008	100176	CAP CER DP 1UF 50V 20% Z5U .38	C4-6,10	4.000	56289	2C37Z5U105M050B
0011	117621	CAP CER DP10PF 100V 5% COG .1L	C7	1.000	96773	DB44BY100J
0012	100168	CAP MYLAR .01UF 200V 10%	C8,9	2.000	56289	192P10392
0015	11979801	CAP CER DP .033UF 50V 10% X7R	C11	1.000	71590	CW20C333K
0016	11979701	CAP CER DP .022UF 50V 10% X7R	C12	1.000	71590	CW20C223K
0017	117636	CAP CER DP330PF 100V 5% COG .1	C13	1.000	96733	DB45BY331J
0018	117640	CAP CER DP27PF 100V 5% COG .1L	C14	1.000	96733	DB44BY270J
0019	99REF50	*** REF DESN'TORS NOT USED ***	C15	.000		
0020	116501	CAP CER DP2200PF 100V 10% X7R	C16	1.000	96733	DB44BX222K
0021	117637	CAP CER DP470PF 100V 5% COG .1	C17	1.000	96733	DB45BY471J
0022	99REF50	*** REF DESN'TORS NOT USED ***	C18	.000		
0023	100178	CAP CER DP .1UF 50V 20% Z5U .3	C19,24	3.000	56289	2C37Z5U104M050B
0023	99REF01	REF DESN'TORS CONT FROM ABOVE	C25	.000		
0024	99REF50	*** REF DESN'TORS NOT USED ***	C20-23	.000		
0030	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0031	100426	DIODE SGNL1N459A 175V	CR2,3	2.000	13715	1N459A
0033	100383	DIODE ZENR 15V 5% .4W 1N965B	CR4	1.000	04713	1N965B
0034	100385	DIODE SGNL1N4151 50V	CR5,6,8	23.000	03508	1N4151
0034	99REF01	REF DESN'TORS CONT FROM ABOVE	9,12-30	.000		
0036	100416	DIODE ZENR6.8V 5% .4W 1N957B	CR7	1.000	04713	1N957B
0039	100395	DIODE ZENR 10V 5% .4W 1N961B	CR10	1.000	04713	1N961B
0040	102879	JUMPER, 22AWG INSULATED .09D	CR11,32	3.000	55210	L-2007-1
0040	99REF01	REF DESN'TORS CONT FROM ABOVE	CR33	.000		
0060	100390	DIODE ZENR 12V 5% .4W 1N963B	CR31	1.000	04713	1N963B
0063	100404	DIODE ZENR 18V 5% .4W 1N967B	CR34	1.000	04713	1N967B
0064	99REF50	*** REF DESN'TORS NOT USED ***	CR35	.000		
0065	123100	DIODE REF 1.23V 2% LM385Z-1.2	CR36,37	2.000	27014	LM385Z-1.2
0066	11933801	SOCKET DIL 24 PCMT .6SP .18HI	J1	1.000		524-AG11D
0067	11973201	CON PC 12 PIN RTANG HDR .1C-C	J2	1.000	27264	22-12-2124
0068	11981001	CON PC 8 PIN RTANG HDR .1C-C F	J3	1.000	27264	22-12-2084
0069	101376	XSTR SINPN2N2219	Q1	1.000	07263	2N2219
0070	700179	XSTR SIPNPMPS-A92 300V 30B150@	Q2	1.000	04713	MPS-A92
0071	705067	XSTR SIPNP2N2905A 60V 100B300@	Q3,4	2.000		2N2905AS
0073	101378	XSTR SIPNP2N3906 40V 100B300@1	Q5	1.000	04713	2N3906
0074	101377	XSTR SINPN2N3904 40V 100B300@1	Q6	1.000	04713	2N3904
0075	102183	POT 15T PC500 10% 3/8W CERM E	R1	1.000	73138	89PR500
0076	119007	RES MF 4.87K .1W 1% 25PPM/C	R2,3	2.000	91637	CMF-55 T9
0078	119041	RES, 10.0K, 1% MF	R4,14	2.000	91637	CMF-55 T9
0079	117576	RES MF 4.99K .1 W 1% 100PPM	R5	1.000		C-RN55D4991F
0080	101564	RES CC1/4W 10M 5%	R6	1.000	01121	CB1065

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0081	101559	RES CC1/4W3.3K 5%	R7	1.000	01121	CB3325
0082	106002	RES CC1/4W2.4M 5%	R8	1.000	01121	CB2455
0083	102470	POT 15T PC 20K 10% 3/8W CERM E	R9	1.000	73138	89PR20K
0084	101608	RES CC1/4W6.2K 5%	R10,17	2.000	01121	CB6225
0085	99REF50	*** REF DESN'TORS NOT USED ***	R11	.000		
0086	102154	POT 15T PC 20 20% 3/8W CERM E	R12	1.000	73138	89PR20
0087	119941	RES MF 200 .1W 1% 25PPM	R13	1.000		C=RN55E2000F
0089	102472	POT 15T PC 10K 10% 3/8W CERM E	R15	1.000	73138	89PR10K
0090	101569	RES CC1/4W1.0K 5%	R16,20	2.000	01121	CB1025
0092	101572	RES CC1/4W 22K 5%	R18	1.000	01121	CB2235
0093	101537	RES CC1/4W300 OHMS 5%	R19	1.000	01121	CB3015
0095	101887	RES CC1/4W7.5 OHMS 5%	R21	1.000	01121	CB75G5
0096	101570	RES CC1/4W 10K 5%	R22,24	5.000	01121	CB1035
0096	99REF01	REF DESN'TORS CONT FROM ABOVE	38,68,70	.000		
0097	101569	RES CC1/4W1.0K 5%	R23,57	2.000	01121	CB1025
0099	101569	RES CC1/4W1.0K 5%	R25	1.000	01121	CB1025
0100	119096	RES MF 33.2K .1W 1% 25PPM/C.	R26	1.000	91637	CMF-55 T9
0101	118844	RES MF 10.0K .1W .1% 5PPM/C	R27	1.000	60393	PR1/10 10K.1%T5
0102	102119	POT 15T PC 2K 10% 3/8W CERM E	R28,34	2.000	73138	89PR2K
0103	119101	RES. 37.4K, 1%, MF	R29	1.000	91637	CMF-55 T9
0104	11949701	RES MF 137K .1W 1% (50PPM/C (.	R30	1.000		RN55C1373F
0105	630440	RES WW PWR2.0K 3W 3% (30PPM/C	R31,69	2.000	12463	T-2A
0107	99REF50	*** REF DESN'TORS NOT USED ***	R32,33	.000		
0109	99REF50	*** REF DESN'TORS NOT USED ***	R35	.000		
0110	106363	RES MF 10.0K .12W .1% 50PPM	R36	1.000	14298	EE-1/8 RN60C
0111	11980401	RES MF 11.0K .1W .1% 50PPM/C	R37	1.000		C=RN55C1102B
0113	101577	RES CC1/4W1.5K 5%	R39	1.000	01121	CB1525
0114	101567	RES CC1/4W820 OHMS 5%	R40	1.000	01121	CB8215
0115	119091	RES MF 29.4K .1W 1% 2	R41	1.000	91637	CMF-55 T9
0116	117818	RES MF 4990HMS.1 W 1% 100 PPM	R42	1.000		C=RN55D4990F
0117	101552	RES CC1/4W 15K 5%	R43	1.000	01121	CB1535
0118	101549	RES CC1/4W 30K 5%	R44,45	2.000	01121	CB3035
0120	101554	RES CC1/4W 24K 5%	R46-48	5.000	01121	CB2435
0120	99REF01	REF DESN'TORS CONT FROM ABOVE	R60,61	.000		
0123	101576	RES CC1/4W 33K 5%	R49,50	3.000	01121	CB3335
0123	99REF01	REF DESN'TORS CONT FROM ABOVE	R62	.000		
0125	101589	RES CC1/4W1.1K 5%	R51-53	3.000	01121	CB1125
0128	101581	RES CC1/4W1.2K 5%	R54,63	2.000	01121	CB1225
0129	103391	POT 18T PC 2K 10% .5W CRMT TO	R55	1.000	73138	68WR2K
0130	101588	RES CC1/4W240 OHMS 5%	R56	1.000	01121	CB2415
0132	99REF50	*** REF DESN'TORS NOT USED ***	R58,59	.000		
0138	101609	RES CC1/4W100 OHMS 5%	R64	1.000	01121	CB1015
0139	101498	RES CC1/2W100 OHMS 5%	R65	1.000	01121	EB1015
0140	101755	RES CC1/4W430K 5%	R66	1.000	01121	CB4345
0141	101684	RES CC1/4W1.2M 5%	R67	1.000	01121	CB1255
0145	100521	TEST POINTBROWN PC MT PARALLE	TP1	1.000	91506	8041-1G3
0146	100522	TEST POINTRED PC MT PARALLE	TP2	1.000	91506	8041-1G4

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0147	123103	TERM SWAGE TUB HO.062MAT.37HI.	TP3	1.000	91833	1540-2
0149	025758	IC OP AMP LM201A A94DB IB75NA	U1	1.000	27014	LM201AH
0150	11982801	IC OP AMP LF412 JFET DUAL A>88	U2	1.000	27014	LF412CH
0151	11783801	IC OP AMP AD542JH JFET A100DB	U3	1.000	24335	AD542JH
0152	11982701	IC OP AMP LF411 JFET A>88DB IB	U4	1.000	27014	LF411CH
0153	102858	OPTOISOLTR CT6 DUAL IC/IF .2MI	U5,6	2.000	50522	MCT6
0155	103039	IC VOLTREG7815 15V 5%,1A,15W-.	U7	1.000	04713	MC7815CT
0156	11980701	IC VOLTREG MC7906CT -6V 5% 1A	U8	1.000	04713	MC7906CT
0157	117261	IC VOLTREG79L15 -15.6/14.4V .0	U9	1.000	04713	MC79L15ACP
0158	11980801	IC VOLTREG LM317LZ 37-2V@.1A	U10	1.000	27014	LM317LZ
0159	11980901	IC CMOS 14584 HEX SCHMITT TRIG	U11	1.000	04713	MC14584BCP
0160	103217	IC CMOS 4049 HEX INV BUFF LT	U12	1.000	02735	MC14049UCP
0161	106621	IC OP AMP 741C A86DB IB.5VA 8D	U13	1.000	07263	741TC
0163	102879	JUMPER, 22AWG INSULATED .09D	W1,2,6	3.000	55210	L-2007-1
0165	10062604	PHMS CRES 4-40 X 1/4		2.000		MS51957-13
0166	100794	INT TOOTH #4 CRES		2.000		MS35333-70
0167	99REF50	*** REF DESN'TORS NOT USED ***	W3-5	.000		
0168	99REF50	*** REF DESN'TORS NOT USED ***	W7-12	.000		
0180	707905804	SCHEM QFP36-4	REF	.000	52542	

SINGLE LEVEL EXPLOSION

ASSY CABLE P2-P4 QFP 10/02/85 07916101 A-----A 4/01/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11972901	CON RTNGLR 12POS RECEPT SHELL	P2	1.000	27264	22-01-2125
0002	11972801	CON RTNGLR 10POS RECEPT SHELL	P4	1.000	27264	22-01-2105
0003	PHANTOM 507916101	W/L CABLE P2-P4 QFP		1.000	52542	
0005	11958201	CONN TERM SKT 22-30 CRIMP AU D		18.000	27264	08-56-0110

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07918601	STD 50-60HZ/115VAC		1.000	52542	
0002	07918602	OPT 10 50-60HZ/100 VAC		1.000	52542	
0003	07918603	OPT 11 50-60HZ/208VAC		1.000	52542	
0004	07918604	OPT 12 50-60HZ/220VAC		1.000	52542	
0005	07918605	OPT 13 50-60HZ/230VAC		1.000	52542	
0006	07918606	OPT 14 50-60HZ/240VAC		1.000	52542	

SINGLE LEVEL EXPLOSION

STD 50-60HZ/115VAC 10/02/85 07918601 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079186TAB	DWG LINE VOLT OPT WIRING QFP	REF	.000	52542	
0002	123236	CKT BREAKR 3A FAST W/INERTIA W	CB1	1.000	81541	T11-3-3.00A-01-31
0004	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD

SINGLE LEVEL EXPLOSION

OPT 10 50-60HZ/100 VAC 10/02/85 07918602 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079186TAB	DWG LINE VOLT OPT WIRING QFP	REF	.000	52542	
0002	123236	CKT BREAKR 3A FAST W/INERTIA W	CB1	1.000	81541	T11-3-3.00A-01-31
0003	06509601	FOILCAL 100VAC		1.000		
0004	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD

SINGLE LEVEL EXPLOSION

OPT 11 50-60HZ/208VAC 10/02/85 07918603 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079186TAB	DWG LINE VOLT OPT WIRING QFP	REF	.000	52542	
0002	123238	CKT BREAKR 1.5A FAST W/INERTIA	CB1	1.000	81541	T11-3-1-1.50A-01-31
0003	06509603	FOILCAL 208VAC		1.000		
0004	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD

SINGLE LEVEL EXPLOSION

OPT 12 50-60HZ/220VAC 10/02/85 07918604 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079186TAB	DWG LINE VOLT OPT WIRING QFP	REF	.000	52542	
0002	123238	CKT BREAKR 1.5A FAST W/INERTIA	CB1	1.000	81541	T11-3-1-1.50A-01-31
0003	06509604	FOILCAL 220VAC		1.000		
0004	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD

SINGLE LEVEL EXPLOSION

OPT 13 50-60HZ/230VAC 10/02/85 07918605 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079186TAB	DWG LINE VOLT OPT WIRING OFF	REF	.000	52542	
0002	123238	CKT BREAKR 1.5A FAST W/INERTIA	CB1	1.000	81541	T11-3-1-1.50A-01-31
0003	06509605	FOILCAL 230VAC		1.000		
0004	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD

SINGLE LEVEL EXPLOSION

OPT 14 50-60HZ/240VAC 10/02/85 07918606 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079186TAB	DWG LINE VOLT OPT WIRING OFF	REF	.000	52542	
0002	123238	CKT BREAKR 1.5A FAST W/INERTIA	CB1	1.000	81541	T11-3-1-1.50A-01-31
0003	06509606	FOILCAL 240VAC		1.000		
0004	100657	INT TOOTH .508 ID.625 OD CPS		1.000	78189	1224-02 CAD

SINGLE LEVEL EXPLOSION

FEATURE 02 METERS QFP26-5 10/02/85 07918703 A------A 5/31/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07905101	STD FRONT PANEL		1.000	52542	
0002	07905003	OPT 30 FRONT PANEL W/METERS		1.000	52542	

SINGLE LEVEL EXPLOSION

FEATURE 02 METERS QFP36-4 10/02/85 07918704 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07905101	STD FRONT PANEL		1.000	52542	
0002	07905004	OPT 30 FRONT PANEL W/METERS		1.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079051	FAB FRONT PANEL W/O MTRS QFP		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M	REF	.000	94222	51-17-709-24
0003	123295	HANDLE OVAL 2.5MTG ALUM BLACK		1.000	06540	10852-A-0832-2
0004	079158	FAB SPACER BAR FRONT PNL QFP		1.000	52542	
0005	10074310	FHMS CRES 8-32 X 5/8		2.000		MS24693-C51
0006	07905401	ASSY PCB INDICATOR		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		1.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		1.000		MS15795-803
0009	100941	NUT KEP 4-40 .281OD .11THK C		1.000	78189	511-041800-00
0010	07910401	ASSY CABLE FRT PNL W/O MTRS QF		1.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079054	FAB PCB INDICATOR QFP		1.000	52542	
0002	100482	TERM SWAGEBIFUR .062MAT.16HI.0		5.000	88245	2000B
0003	123362	LED GRN HLMP3507 12MCD@20MA .2	DS1	1.000	28480	HLMP-3507
0004	123363	LED YEL HLMP3400 4MCD@10MA .2D	DS2	1.000	28480	HLMP-3400
0005	117227	LED RED CMD5753 9MCD@20MA .2D*	DS3	1.000	71744	CMD5753
0006	103201	LED ORANGE MV5153 6MCD@20MA 63	DS4	1.000	50522	MV5153

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 507910401	W/L CABLE FRT PNL W/O MTRS QFF		1.000	52542	
0002	11985101	CON RTNGLR 8POS RECEPT SHELL	P3	1.000	27264	22-01-2085
0003	11958201	CONN TERM SKT 22-30 CRIMP AU D		5.000	27264	08-56-0110

SINGLE LEVEL EXPLOSION

OPT 30 FRONT PANEL W/METERS 10/02/85 07905003 A------A 5/31/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079050	FAB FRONT PANEL W/METERS QFP		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M		1.000	94222	51-17-709-24
0003	123295	HANDLE OVAL 2.5MTG ALUM BLACK		1.000	06540	10852-A-0832-2
0004	079158	FAB SPACER BAR FRONT PNL QFP		1.000	52542	
0005	10074310	FHMS CRES 8-32 X 5/8		2.000		MS24693-C51
0006	07905401	ASSY PCB INDICATOR		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		1.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		1.000		MS15795-803
0009	100941	NUT KEP 4-40 .2810D .11THK C		1.000	78189	511-041800-00
0011	PHANTOM 07906801	ASSY METER 0-30VOLTS 1WM	M101	1.000	52542	
0012	PHANTOM 06521002	ASSY METER 0-5AMPS 1WM	M102	1.000	52542	
0013	07905301	ASSY PCB METER CAL QFP		1.000	52542	
0014	12305906	PHMS CRES 4-40 X 3/8 BLACK OXI		1.000		MS51957-15B
0016	07910402	ASSY CABLE FRT PNL W/MTRS QFP		1.000	52542	

SINGLE LEVEL EXPLOSION

OPT 30 FRONT PANEL W/METERS 10/02/85 07905004 A------A 4/01/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079050	FAB FRONT PANEL W/METERS QFP		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M	REF	.000	94222	51-17-709-24
0003	123295	HANDLE OVAL 2.5MTG ALUM BLACK		1.000	06540	10852-A-0832-2
0004	079158	FAB SPACER BAR FRONT PNL QFP		1.000	52542	
0005	10074310	FHMS CRES 8-32 X 5/8		2.000		MS24693-C51
0006	07905401	ASSY PCB INDICATOR		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		1.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		1.000		MS15795-803
0009	100941	NUT KEP 4-40 .2810D .11THK C		1.000	78189	511-041800-00
0011	PHANTOM 07906901	ASSY METER 0-40VOLTS 1WM	M101	1.000	52542	
0012	PHANTOM 07906301	ASSY METER 0-4AMPS 1WM	M102	1.000	52542	
0013	07905301	ASSY PCB METER CAL QFP		1.000	52542	
0014	12305906	PHMS CRES 4-40 X 3/8 BLACK OXI		1.000		MS51957-15B
0016	07910402	ASSY CABLE FRT PNL W/MTRS QFP		1.000	52542	
0017	079050TAB	ASSY PANEL FRONT OPT 30 QFP	REF	.000	52542	

SINGLE LEVEL EXPLOSION

ASSY METER 0-30VOLTS 1WM 10/02/85 07906801 A15426A 8/09/84

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11746701	METER 1MA 43 OHM RIGHT ZERO NO		1.000	52542	MODUTEC 1WM PER DESC
0002	07907204	METER SCALE 0-30VOLTS 1WM 0-RI		1.000	32171	

SINGLE LEVEL EXPLOSION

ASSY METER 0-40VOLTS 1WM 10/02/85 07906901 A15426A 8/09/84

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11746701	METER 1MA 43 OHM RIGHT ZERO NO		1.000	52542	MODUTEC 1WM PER DESC
0002	07907205	METER SCALE 0-40VOLTS 1WM 0-RI		1.000	32171	

SINGLE LEVEL EXPLOSION

ASSY METER 0-4AMPS 1WM 10/02/85 07906301 A15426A 8/09/84

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11746801	METER 1MA 43 OHM LEFT ZERO NO		1.000	52542	MODUTEC 1WM PER DESC
0002	07906106	METER SCALE 0-4AMPERES 1WM 0-L		1.000	32171	

SINGLE LEVEL EXPLOSION

ASSY METER 0-5AMPS 1WM 10/02/85 06521002 A15426A 8/09/84

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11746801	METER 1MA 43 OHM LEFT ZERO NO		1.000	52542	MODUTEC 1WM PER DESC
0002	07906107	METER SCALE 0-5AMPERES 1WM 0-L		1.000	32171	

SINGLE LEVEL EXPLOSION

ASSY PCB METER CAL QFP 10/02/85 07905301 A------A 11/30/84

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079053	FAB PCB METER CAL		1.000	52542	
0002	2079053	ARTWORK PCB METER CAL	REF	.000	52542	
0003	123202	SPCR SWAGE 4-40 .375L X.25RND		1.000	06540	9535C-A-0440-17
0004	100482	TERM SWAGEBIFUR .062MAT.16HI.0		3.000	88245	2000B
0005	106328	RES MF 9.53K .12W 1% 100PPM	R101	1.000	91637	CMF-60 TI
0006	118839	POT 20T PC5K .5W 10% ENDADJ (.	R102	1.000	73138	66XR5K
0007	117551	POT 18T PC 500OHMS.5W@70/C 10%	R103	1.000	73138	68XR500
0008	123283	FLAT WSHR #10 .194ID.3120D.03T		1.000		BY DESCRIPTION

SINGLE LEVEL EXPLOSION

ASSY CABLE FRT PNL W/MTRS QFP 10/02/85 07910402 A-----A 12/05/84

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 507910402	W/L CABLE FRT PNL W/MTRS QFP		1.000	52542	
0002	11985101	CON RTNGLR 8POS RECEPT SHELL	P3	1.000	27264	22-01-2085
0003	11958201	CONN TERM SKT 22-30 CRIMP AU D		8.000	27264	08-56-0110

SINGLE LEVEL EXPLOSION

FEATURE 03 OUTPUT SWITCHING QF 10/02/85 07918802 A------A 5/30/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07904001	STD SINGLE POLARITY OUTPUT		1.000	52542	
0002	07904002	OPT 31 DUAL POLARITY OUTPUT		1.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079040	FAB PCB RELAY		1.000	52542	
0002	123280	CON 1CCT PC PIN .250W .032TH	1,3	2.000	79963	836
0003	123279	CON 1CCT PC PIN .187W .032TH	2,4	2.000	79963	894
0005	117570	CAP CER DP,01UF 100V 20% X7R	C1,9	2.000	04222	SR201C103MAA
0006	99REF50	*** REF DESN'TORS NOT USED ***	C2	.000		
0007	100178	CAP CER DP .1UF 50V 20% Z5U .3	C3,4,6	3.000	56289	2C37Z5U104M050B
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	C5	1.000	74840	477TTA35A
0011	99REF50	*** REF DESN'TORS NOT USED ***	C7,8,10	.000		
0015	100385	DIODE SGNL1N4151 50V	CR1,2	2.000	03508	1N4151
0017	99REF50	*** REF DESN'TORS NOT USED ***	CR3,4	.000		
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI	J1	1.000	27264	22-11-2032
0020	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1.000	27264	22-11-2102
0022	119795	RELAY REED 24V 2FA HG 725R NO	K1	1.000	95348	6522A-241-5
0023	123221	RELAY REED 24V 2FC HG 5A CARRY	K2	1.000	71482	HGR2M51111N00
0024	99REF50	*** REF DESN'TORS NOT USED ***	K3,4	.000		
0026	106616	XSTR SIPNPMPSA14 30V B>10K@10M	Q1,2	2.000	04713	MPSA14
0028	99REF50	*** REF DESN'TORS NOT USED ***	Q3,4	.000		
0030	101976	RES CC1/8W100K 5%	R1	1.000	01121	BB1045
0031	101711	RES CC1/8W1.0K 5%	R2	1.000	01121	BB1025
0032	101697	RES CC1/8W 10K 5%	R3,4	2.000	01121	BB1035
0034	102879	JUMPER, 22AWG INSULATED .09D	R5,12	2.000	55210	L-2007-1
0035	101694	RES CC1/8W 47K 5%	R6-8	3.000	01121	BB4735
0038	99REF50	*** REF DESN'TORS NOT USED ***	R9,10,13	.000		
0040	101792	RES CC1/8W4.7K 5%	R11	1.000	01121	BB4725
0042	117345	CON 1 CTPCPIN .04D .35L>.05MTG	TP1	1.000	06776	CP-92-3
0044	11979601	IC CMOS 74HC266 QUAD-2IN NOR G	U1	1.000	27014	MM74HC266
0045	116948	IC CMOS 14538 2*MONOMULIVIB	U2	1.000	04713	MC14538BCP
0046	99REF50	*** REF DESN'TORS NOT USED ***	U3	.000		
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	U4	1.000	04713	MC14001BCP
0048	117101	IC VOLTREG78L05 5V 5% (.4W@75C	U5	1.000	04713	MC78L05ACP
0049	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	U6	1.000		4N37
0050	102879	JUMPER, 22AWG INSULATED .09D	W1,2	2.000	55210	L-2007-1
0060	707904001	SCHEM RELAY BD NO POLARITY	REF	.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079040	FAB PCB RELAY		1.000	52542	
0002	123280	CON 1CCT PC PIN .250W .032TH	1,3	2.000	79963	836
0003	123279	CON 1CCT PC PIN .187W .032TH	2,4	2.000	79963	894
0005	117570	CAP CER DP.01UF 100V 20%.X7R	C1,2,9	4.000	04222	SR201C103MAA
0005	99REF01	REF DESN'TORS CONT FROM ABOVE	C10	.000		
0007	100178	CAP CER DP .1UF 50V 20% Z5U .3	C3,4,6	3.000	56289	2C37Z5U104M050B
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	C5	1.000	74840	477TTA35A
0011	99REF50	*** REF DESN'TORS NOT USED ***	C7,8	.000		
0015	100385	DIODE SGNL1N4151 50V	CR1-4	4.000	03508	1N4151
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI	J1	1.000	27264	22-11-2032
0020	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1.000	27264	22-11-2102
0022	119795	RELAY REED 24V 2FA HG 725R NO	K1,3	2.000	95348	6522A-241-5
0023	123221	RELAY REED 24V 2FC HG 5A CARRY	K2,4	2.000	71482	HGR2M51111N00
0026	106616	XSTR SIFNPMPSA14 30V B>10K@10M	Q1-4	4.000	04713	MPSA14
0030	101976	RES CC1/8W100K 5%	R1	1.000	01121	BB1045
0031	101711	RES CC1/8W1.0K 5%	R2,5	2.000	01121	BB1025
0032	101697	RES CC1/8W 10K 5%	R3,4	2.000	01121	BB1035
0035	101694	RES CC1/8W 47K 5%	R6-10	5.000	01121	BB4735
0040	101792	RES CC1/8W4.7K 5%	R11,12	2.000	01121	BB4725
0041	99REF50	*** REF DESN'TORS NOT USED ***	R13	.000		
0042	117345	CON 1 CTPCPIN .04D .35L).05MTG	TP1	1.000	06776	CP-92-3
0044	11979601	IC CMOS 74HC266 QUAD-2IN NOR G	U1	1.000	27014	MM74HC266
0045	116948	IC CMOS 14538 2*MONOMULIVIB	U2	1.000	04713	MC14538BCP
0046	103937	IC CMOS SS4011 4 2IN NAND 14DI	U3	1.000	04713	MC14011BCP
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	U4	1.000	04713	MC14001BCP
0048	117101	IC VOLTREG78L05 5V 5% (.4W@75C	U5	1.000	04713	MC78L05ACP
0049	117530	OPTOISOLTR4N37 IC/IF)1 1KV (10	U6	1.000		4N37
0050	99REF50	*** REF DESN'TORS NOT USED ***	W1,2	.000		
0060	707904002	SCHEM RELAY BD W/POLARITY	REF	.000	52542	

SINGLE LEVEL EXPLOSION

CHAPTER 6

DRAWINGS

6-1. INTRODUCTION

6-2. This chapter contains the assembly and schematic diagrams for the QFP Series Power Supplies. The parts list contained in chapter 5 relates to the reference designation callouts on the diagrams.

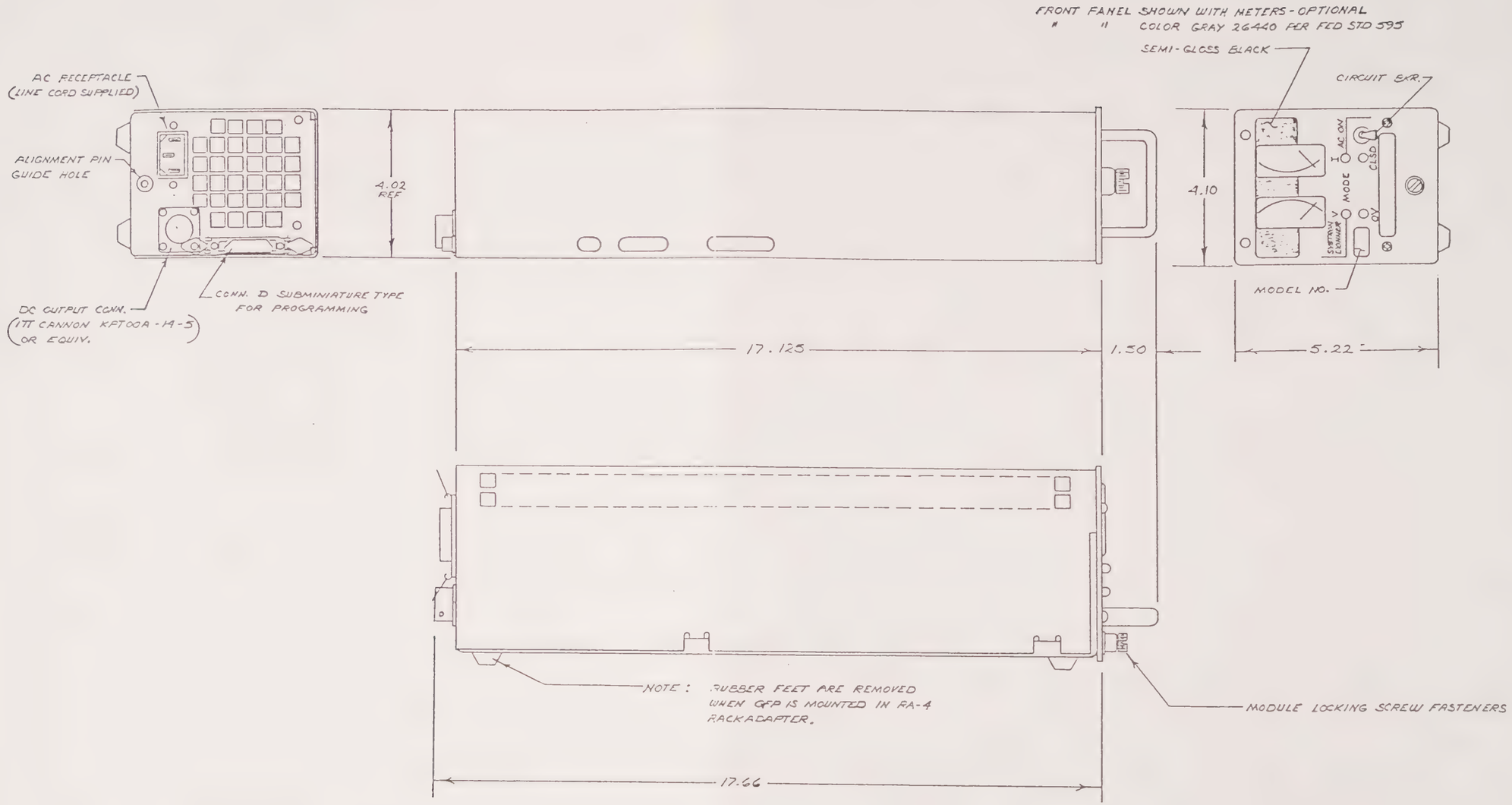
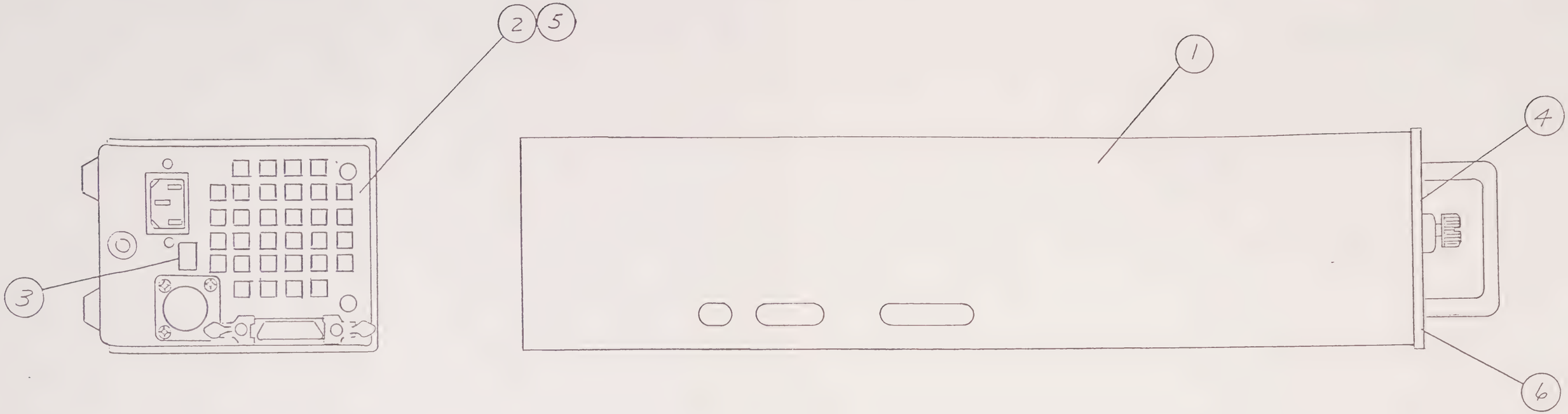
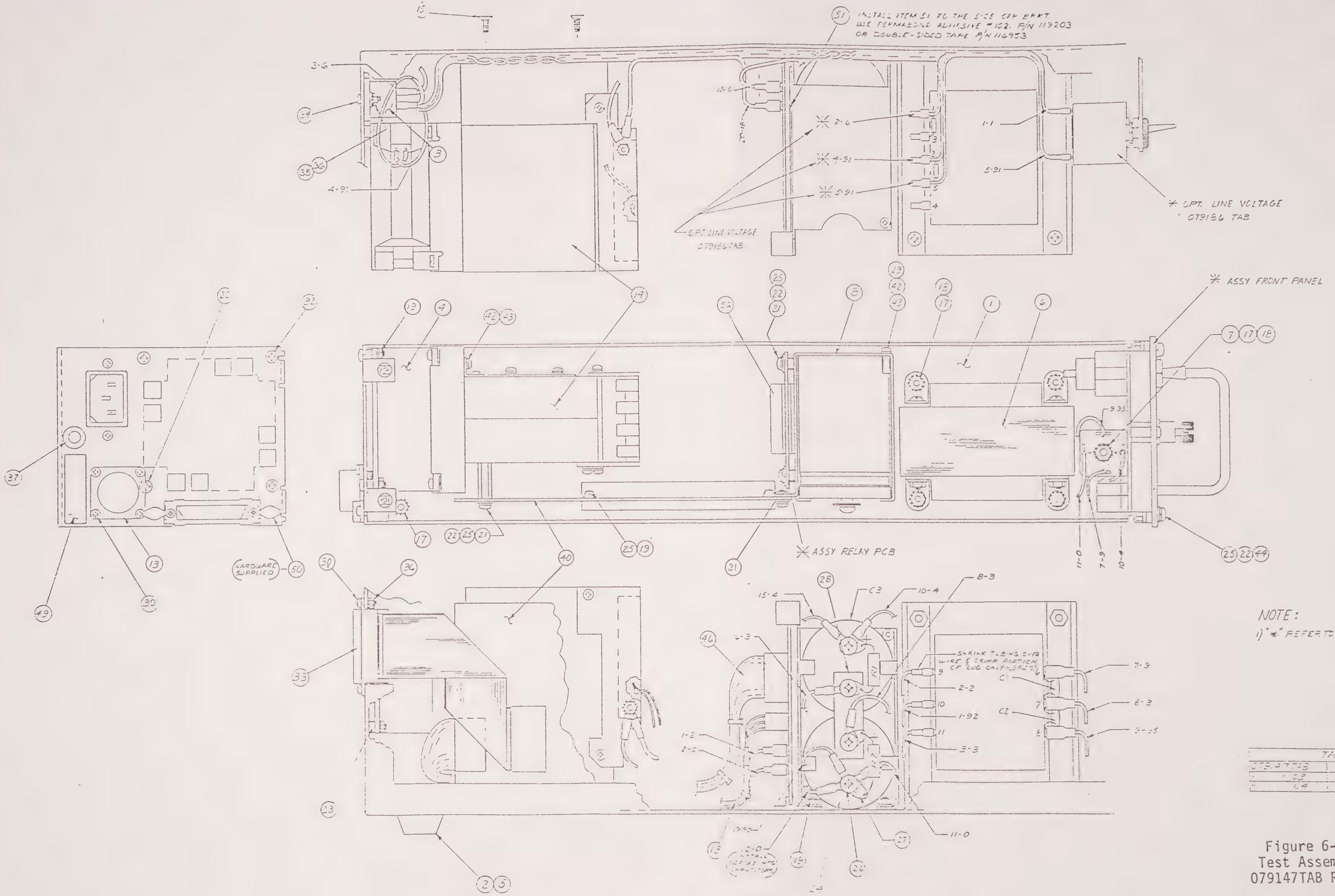


Figure 6-1.
QFP Series Outline Drawing
079057 Rev A



TABLET		
079146TAB	MODEL	P/L
" " 01		
" " 02		
" " 03	QFP26-5	07914603
" " 04	QFP36-4	07914604

Figure 6-2.
QFP Shipping Assembly
079146TAB Rev A


INSTALL ITEM 51 TO THE SIDE CAP BRKT WITH PERMABOND ADHESIVE #102. P/N 113203 OR DOUBLE-SIDED TAPE P/N 116953
* OPT. LINE VOLTAGE 079136 TAB
OPT. LINE VOLTAGE 079136 TAB
* ASSY FRONT PANEL
* ASSY RELAY PCB
HARDWARE SUPPLIED
SHRINK TUBING OVR WIRE & CRIMP PORTION OF LUG ONLY (3 PLCS)
NOTE:
1) "*" REFER TO OPTION DWGS.

TABULATION		
OPTION	MODEL	P/N
-03	QFP 26-3	079147-03
-04	QFP 5-4	079147-04

Figure 6-3.
Test Assembly
079147TAB Rev A

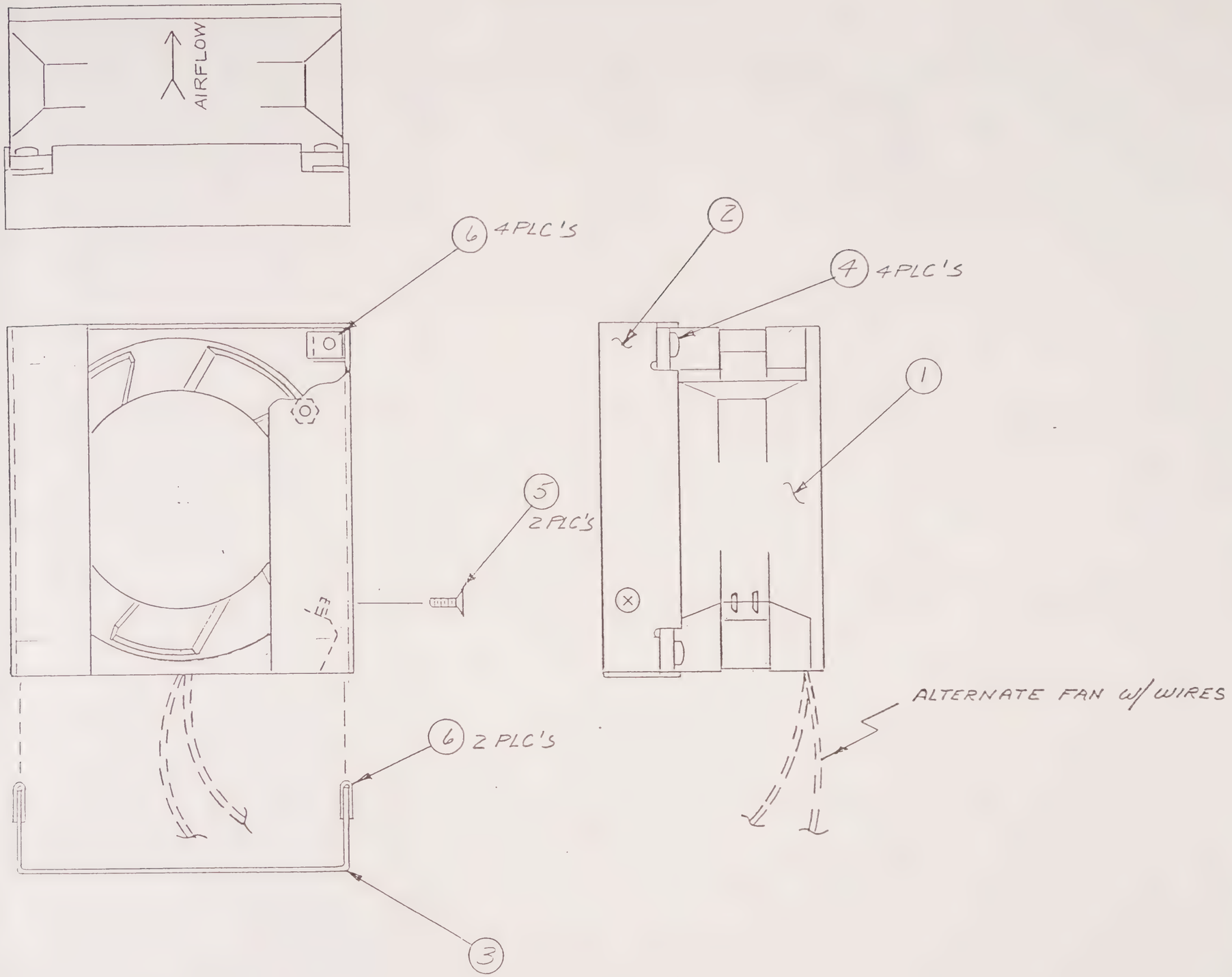
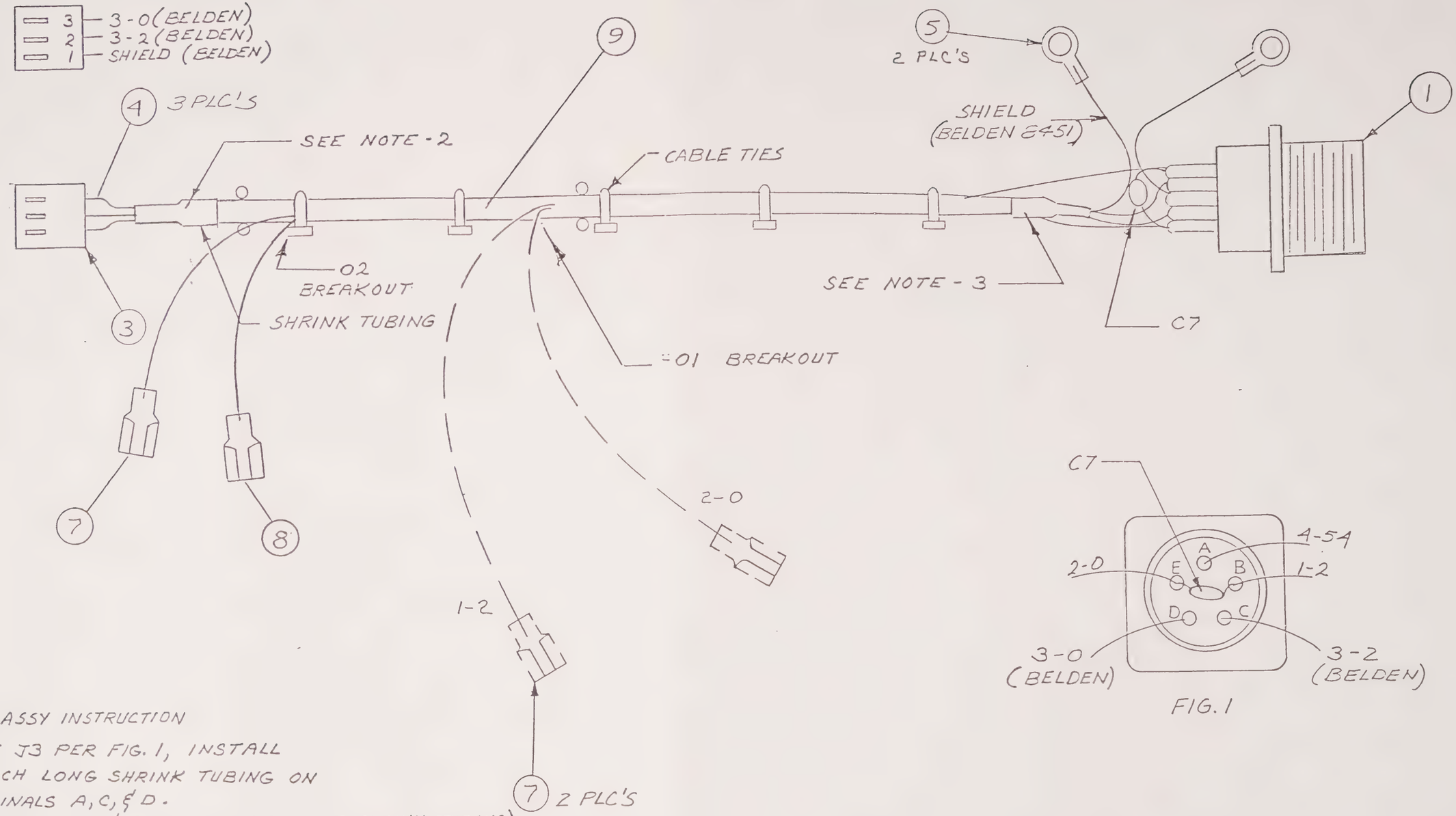


Figure 6-4.
Fan Assembly
07916601 Rev A



NOTES: ASSY INSTRUCTION

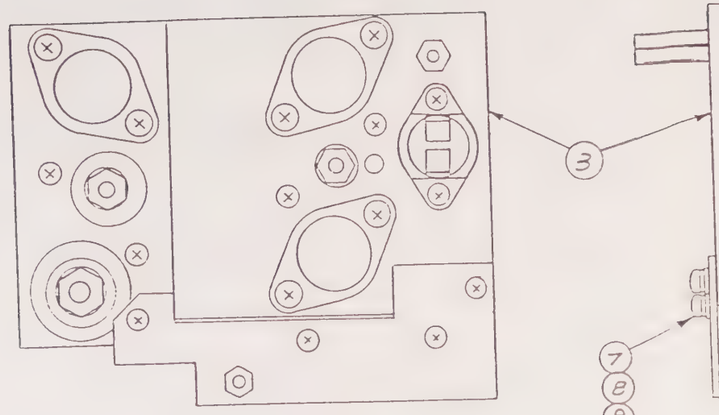
1) WIRE J3 PER FIG. 1, INSTALL 1/2 INCH LONG SHRINK TUBING ON TERMINALS A, C, & D. (TERMINALS E & B DO NOT REQUIRE SHRINK TUBING)
2) STRIP BELDEN 1"
3) " " 2 1/2". CUT RED & BLK TO 1 1/4"

TOTAL LENGTH OF RED & BLK WIRES IS 10 3/4" LONG.

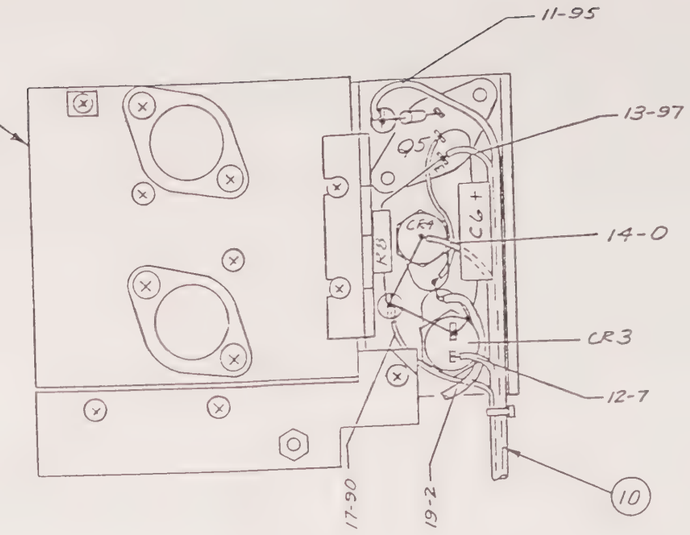
FIG. 1

Figure 6-5.
Output Cable Assembly
07921902 Rev A

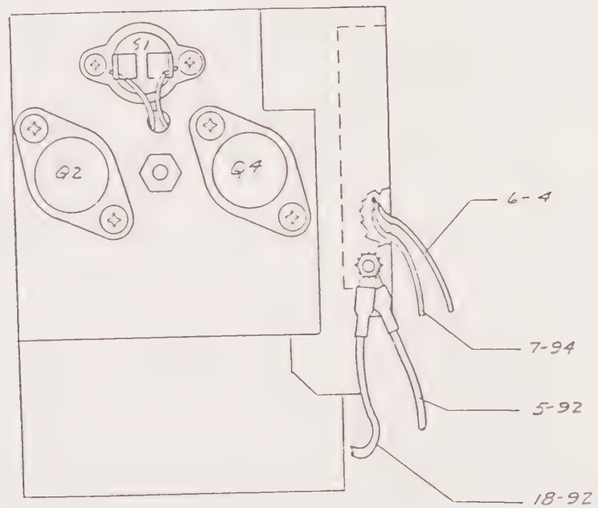
TABULATION		
079154 TAB	MODEL	P/L
" "		
" "		
" " 03	QFP 26-5	07915403
" " 04	QFP 36-4	07915404

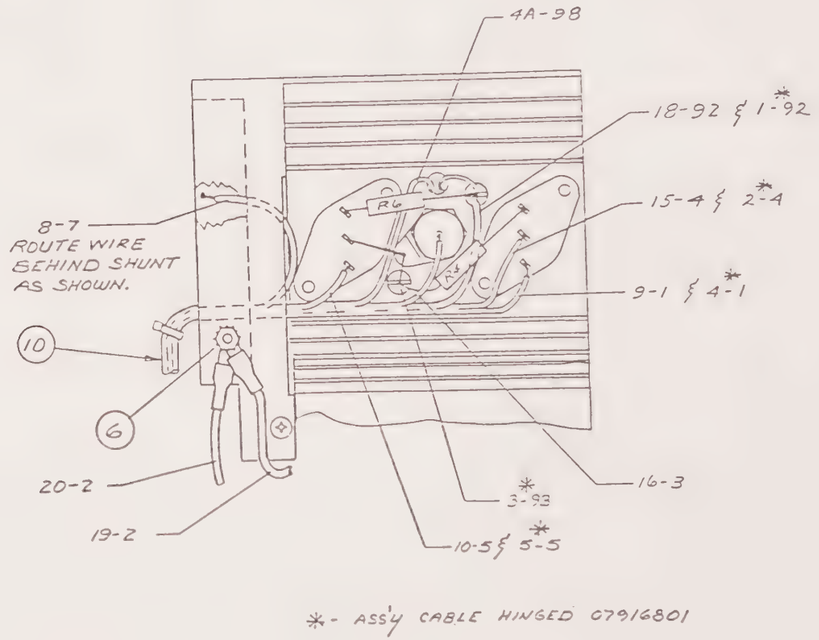


VIEW
LEFT SIDE



VIEW
RIGHT SIDE





*- ASS'Y CABLE HINGED 07916801

Figure 6-6.
Top Heatsink Assembly
079154TAB Rev A

TABULATION		
079043 TAB	MODEL	P/L
" "		
" "		
" "03	QFP 26-5	07904303
" "04	QFP36-4	07904304

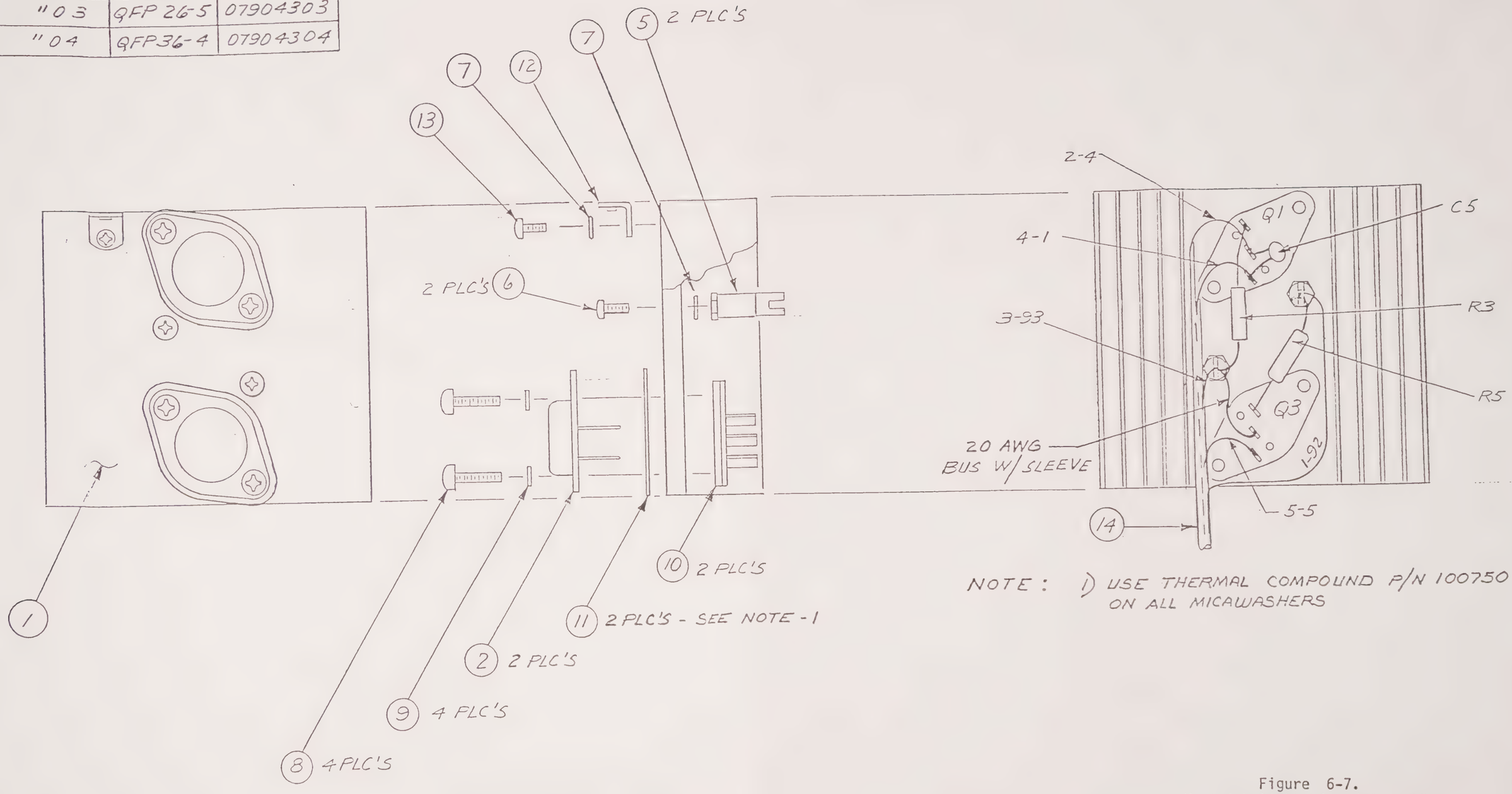


Figure 6-7.
Heatsink Right Hinged Assembly
079043TAB Rev A

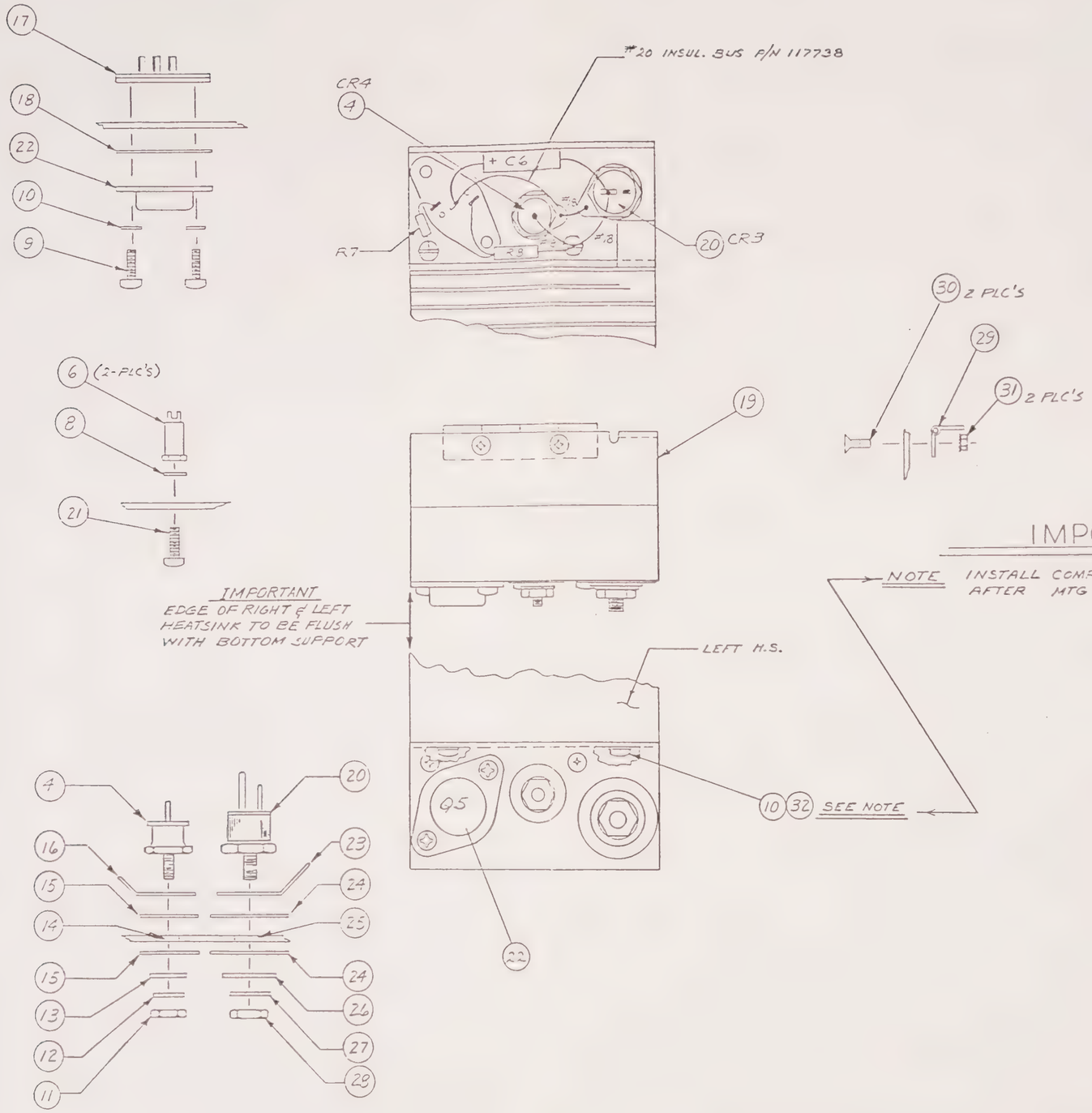
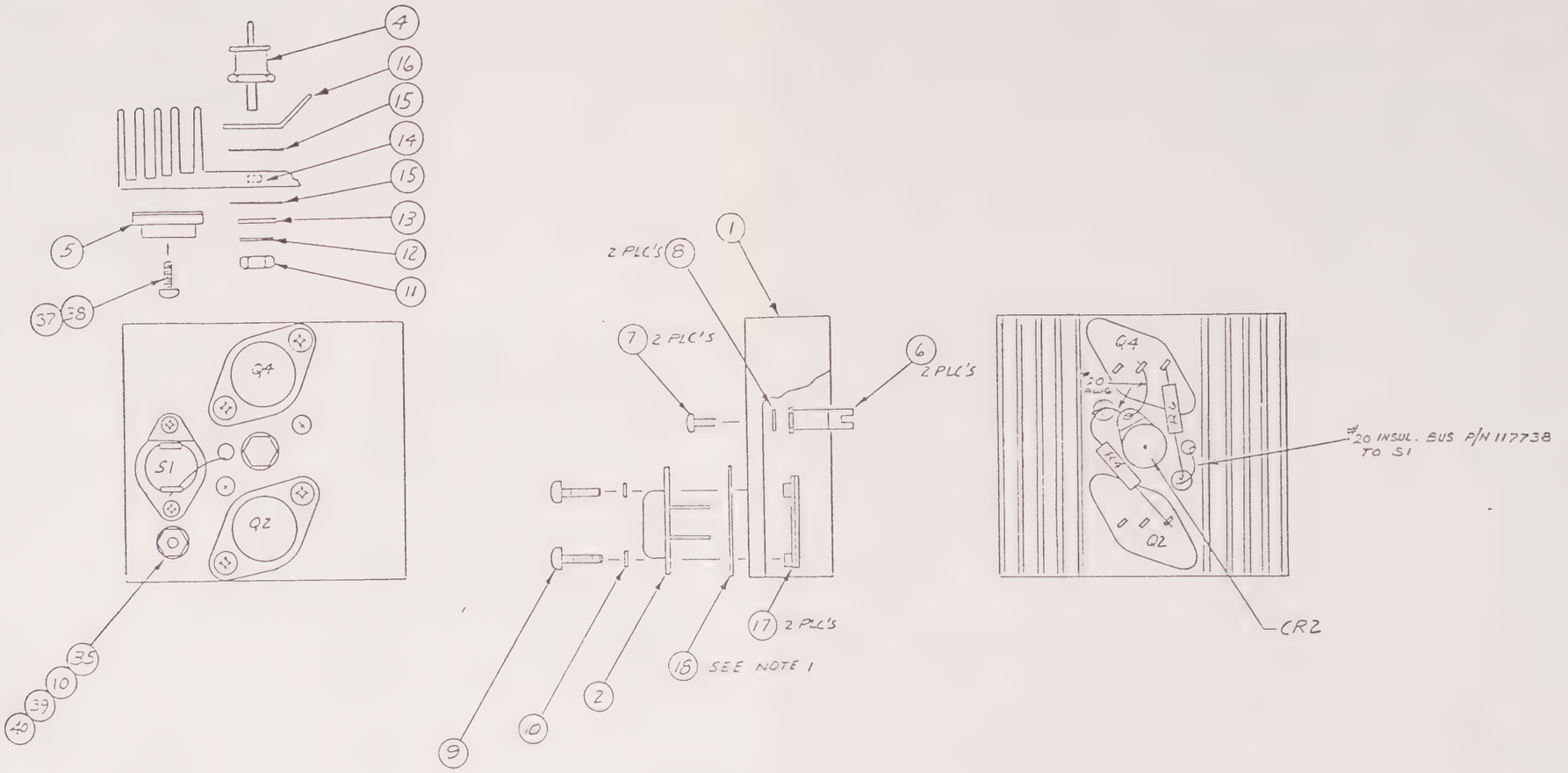


Figure 6-8.
Heatsink and Support Assembly
079044TAB Rev A (Sheet 1 of 2)



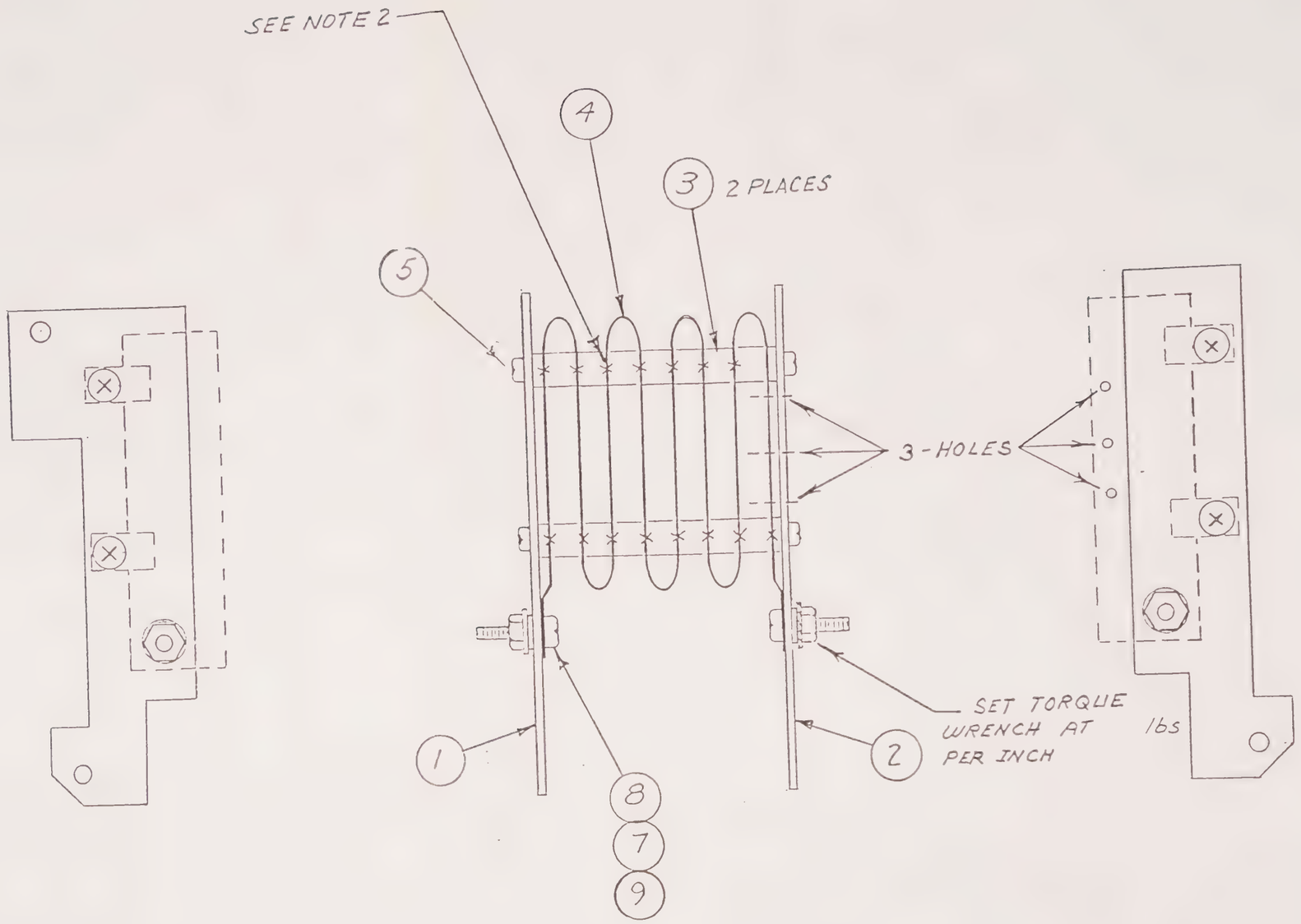
STEP 1

TABULATION		
079044TAB	MODEL	P/L
" "		
" "		
" " 03	GFP26-5	07904403
" " 04	QFP36-4	07904404

NOTES

1) USE THERMAL COMPOUND P/N 100750 ON ALL MICAWASHER.
2) INSTALL ITEM 1 TO ITEM 19 BEFORE INSTALLING COMPONENT ON ITEM 19.

Figure 6-8.
Heatsink and Support Assembly
079044TAB Rev A (Sheet 2 of 2)

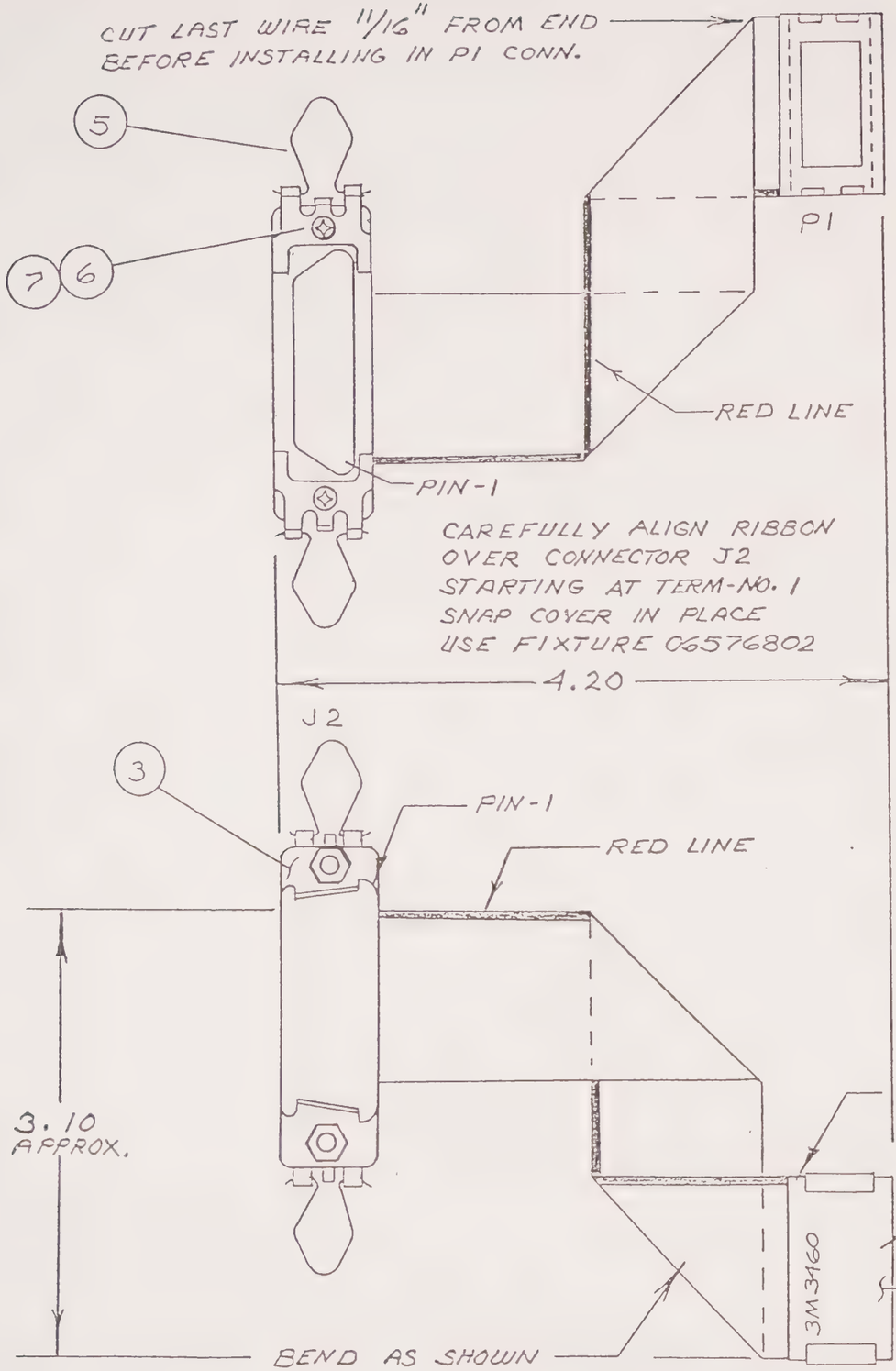


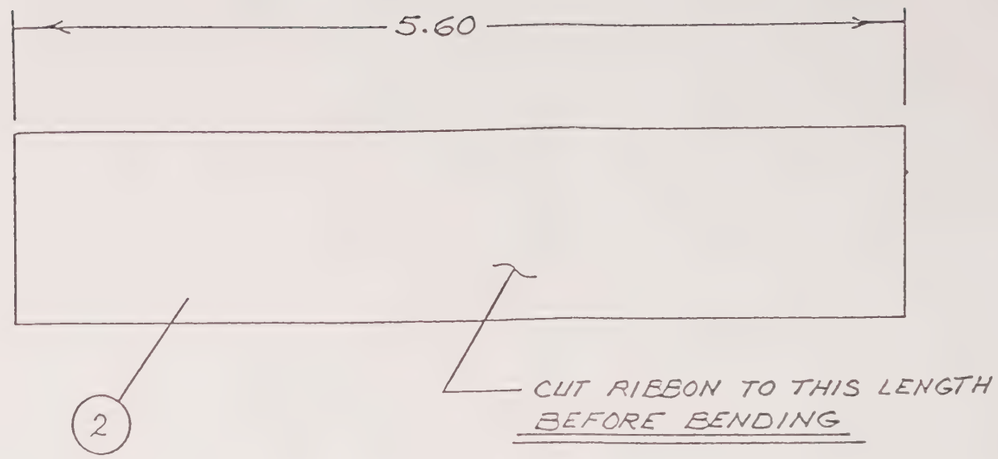
NOTE:

1) USE SHUNT FORMING FIXTURE, BEFORE INSTALLING SHUNT.

2) USE ADHESIVE P/N 119203 ON SHUNT TO NYLON CROSS MEMBER INDICATED BY X

Figure 6-9.
Shunt Assembly
07915503 Rev A





IMPORTANT - FLAT SIDE OF CABLE (NO-RIDGES)
TO BE MOUNTED AWAY FROM TERMINAL PINS
ON J2 CONN. (25-PIN) & P1 CONN. (24-PIN)

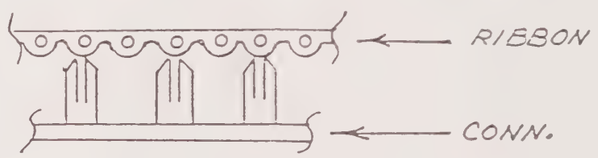


Figure 6-10.
J2-P1 Ribbon Cable Assembly
06585602 Rev A

PARTS LIST	MODEL
06582901	HFP500-1
02	HRP 60-7
03	36-10
04	200-.7
05	16-2
06	QFP 6-12
07	16-7
08	26-5
09	36-4
10	60-25
11	75-2

PARTS LIST	MODEL
06582912	HRP36-10 (OPT 32)
13	8-20
14	HFP500-1 (OPT 32)
15	QFP100-1.5
16	200-.8
17	HFP150-2
18	HRP36-10
19	60-7
20	60-7 (OPT 32)

PARTS LIST	MODEL
06582921	HRP36-10 (OPT 32)

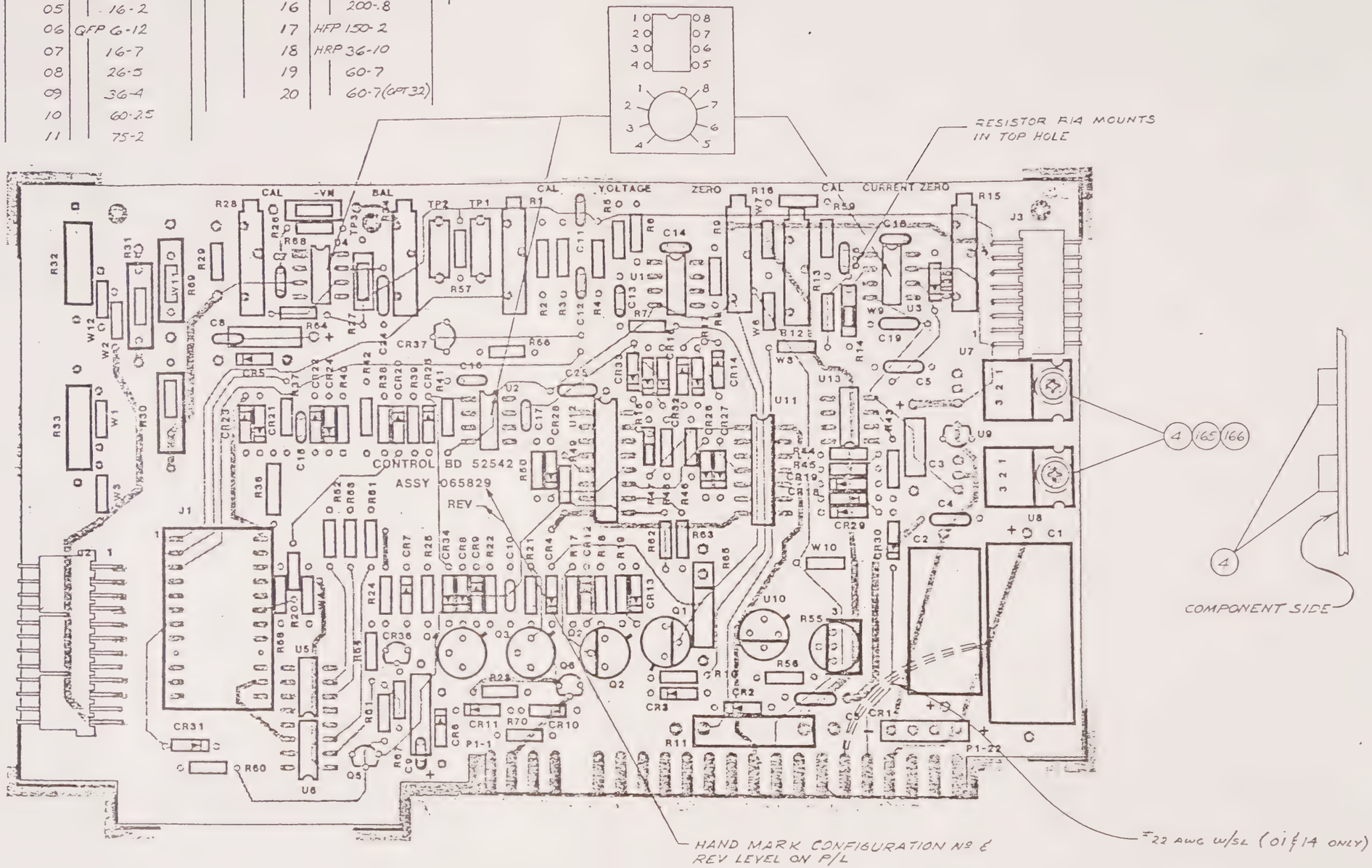


Figure 6-11.
A1, Control PC Assembly
065829TAB Rev G

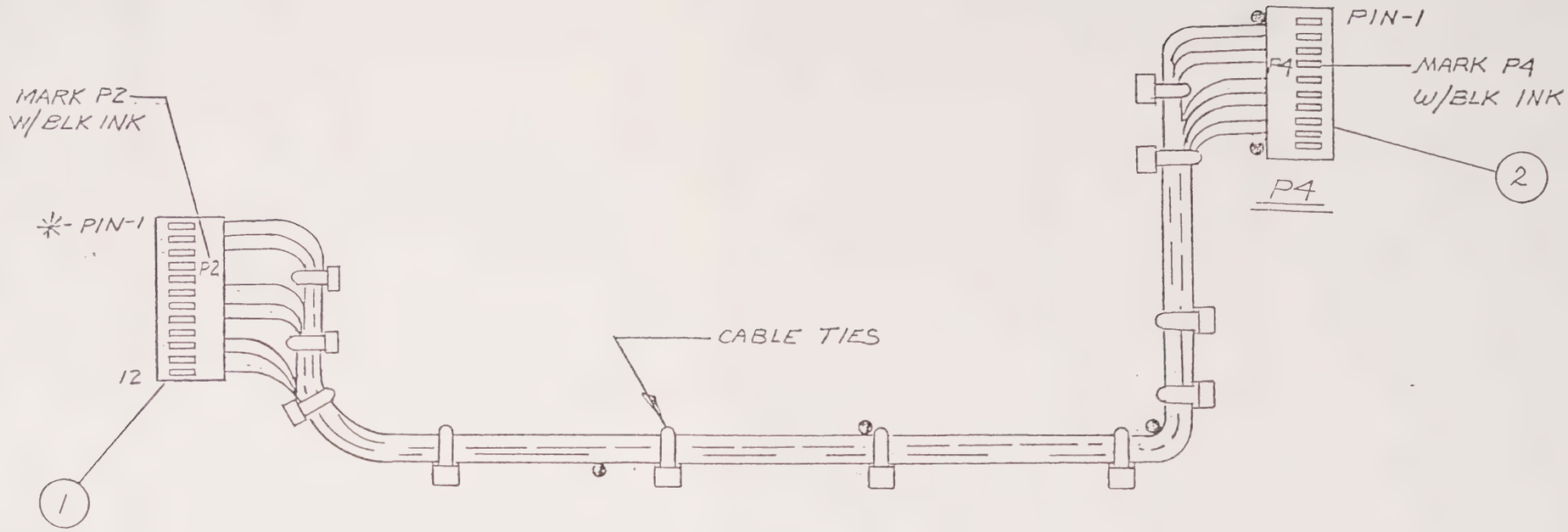
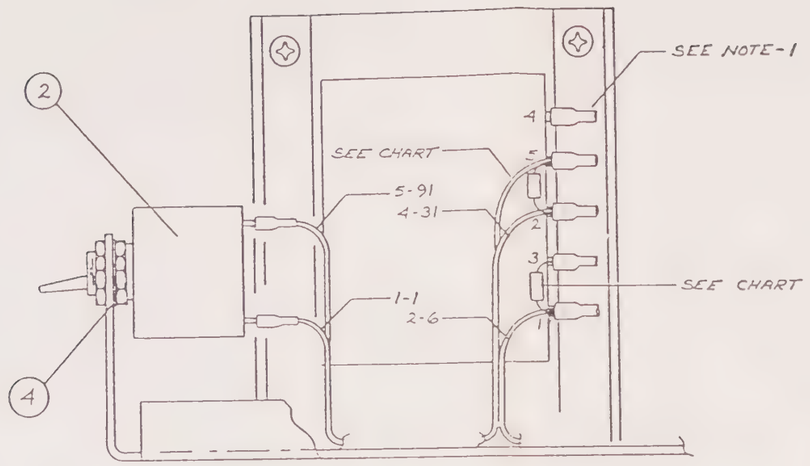
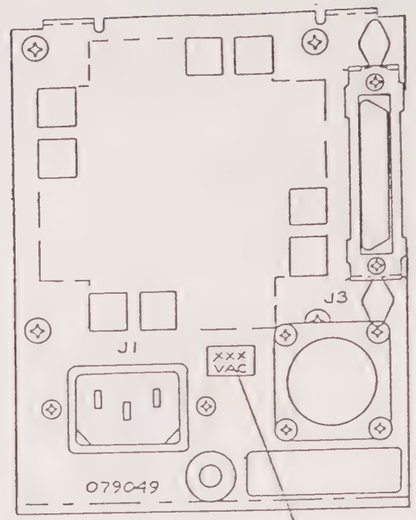


Figure 6-12.
P2-P4 Cable Assembly
07916101 Rev A





	AC- INPUT WIRING		
OPTION	VOLTAGE	NO-OHM JUMPER	WIRE 5-91
10	100V	1-3, 2-5	TO TERM. 4
01	115V/120V	1-3, 2-5	5
11 & 12	208V/220V	2-3	4
13 & 14	230V/240V	2-3	5

NOTE: 1) USE SHRINK TUBING OVER TERM'S 1 THRU 5 & CIRCUIT BKR.

- 14	240 VAC	07918606
- 13	230	05
- 12	220	04
- 11	208	03
- 10	100	02
- 01	115	01
OPT. NO.	INPUT VOLT.	PARTS LIST

Figure 6-13.
Feature 01, Line Voltage Options
Assembly 079186TAB Rev A

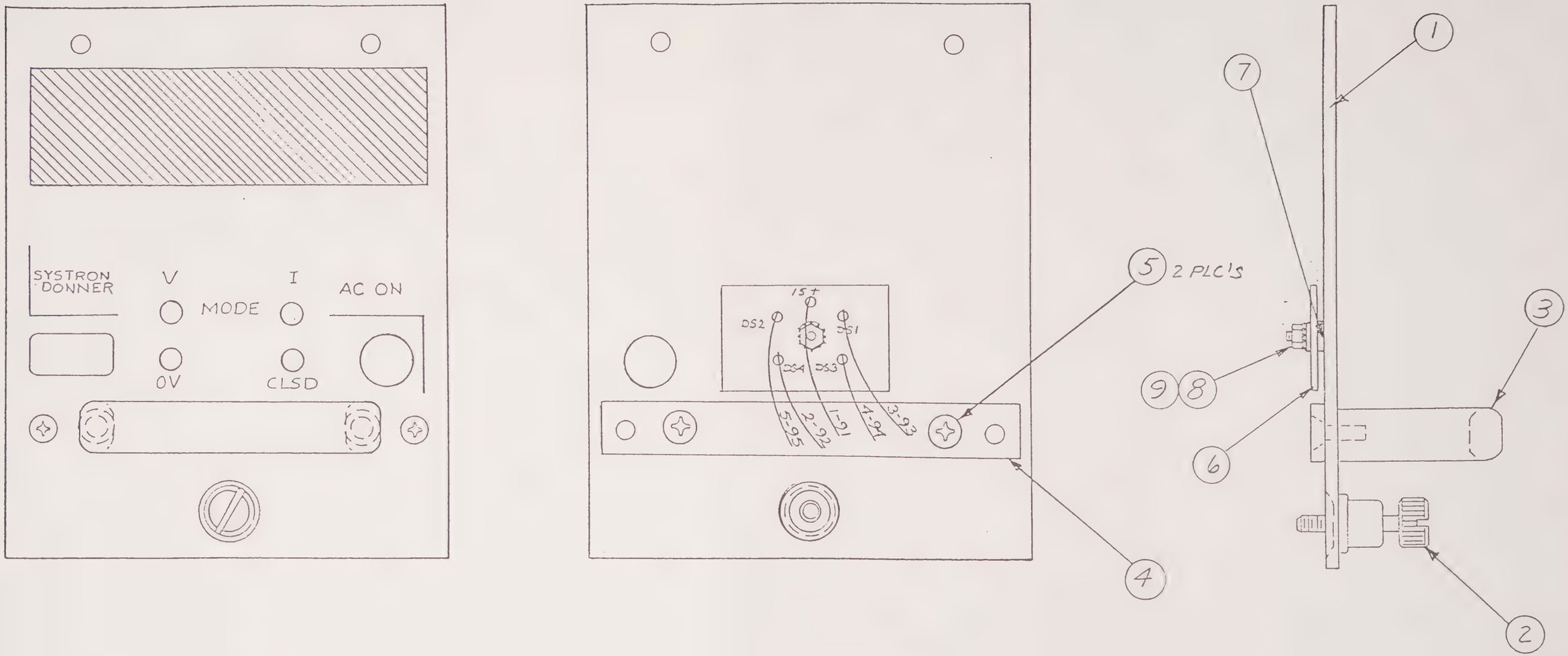


Figure 6-14.
Standard Front Panel (No Meters)
Assembly 07905101 Rev A

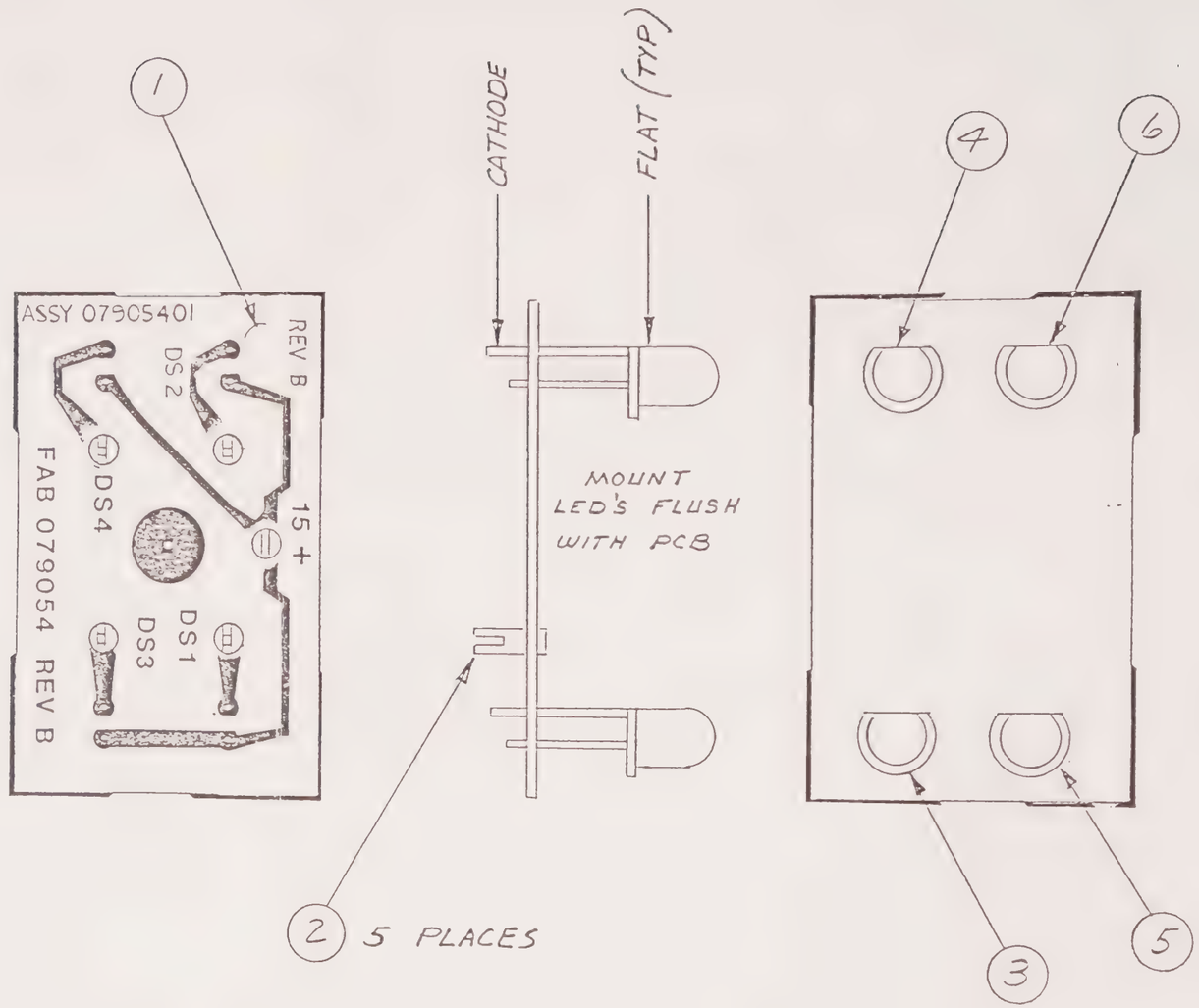
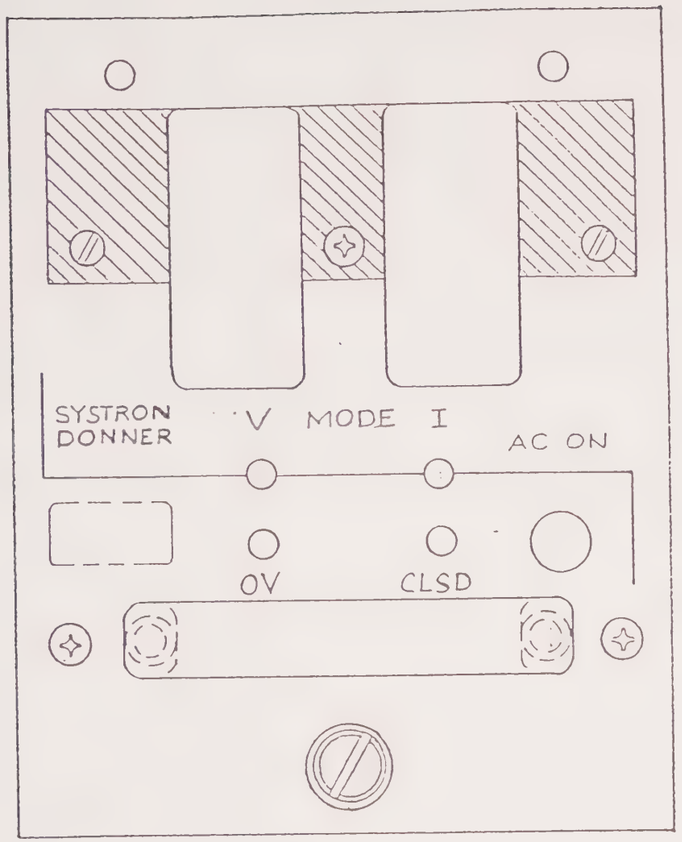
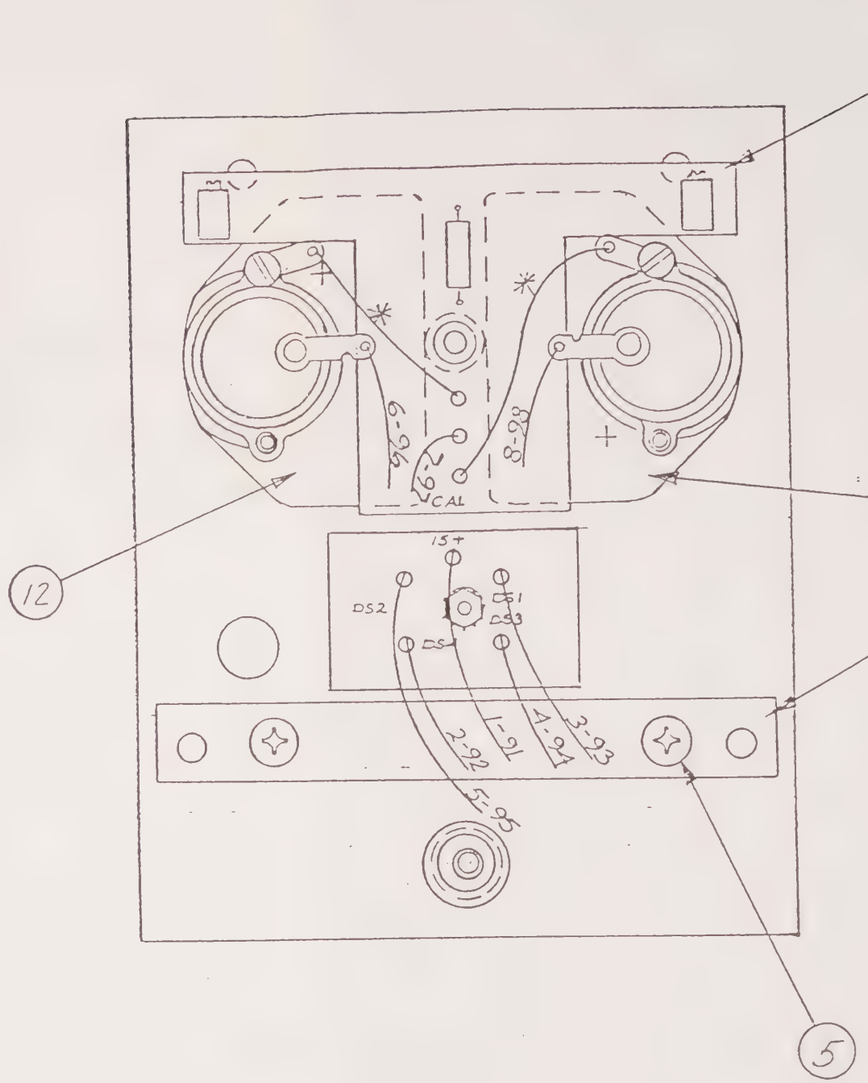
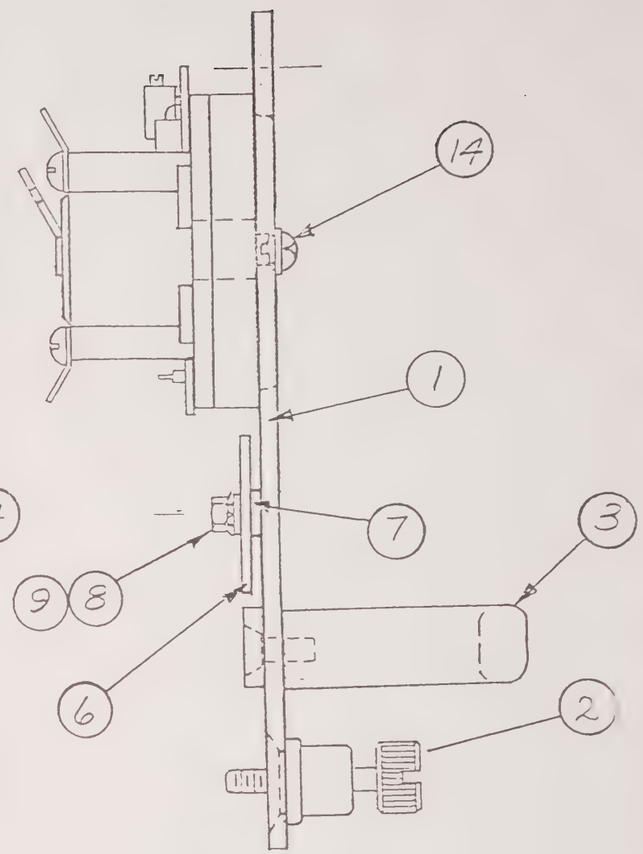


Figure 6-15.
Indicator PC Assembly
07905401 Rev B







PARTS LIST	MODEL
07905001	QFP 6 - 12
02	16 - 7
03	26 - 5
04	36 - 4
05	60 - 2.5
06	75 - 2
07	100 - 1.5
08	200 - .8

Figure 6-16. Feature 02,
Option 30 Front Panel (With Meters)
Assembly 079050TAB Rev A

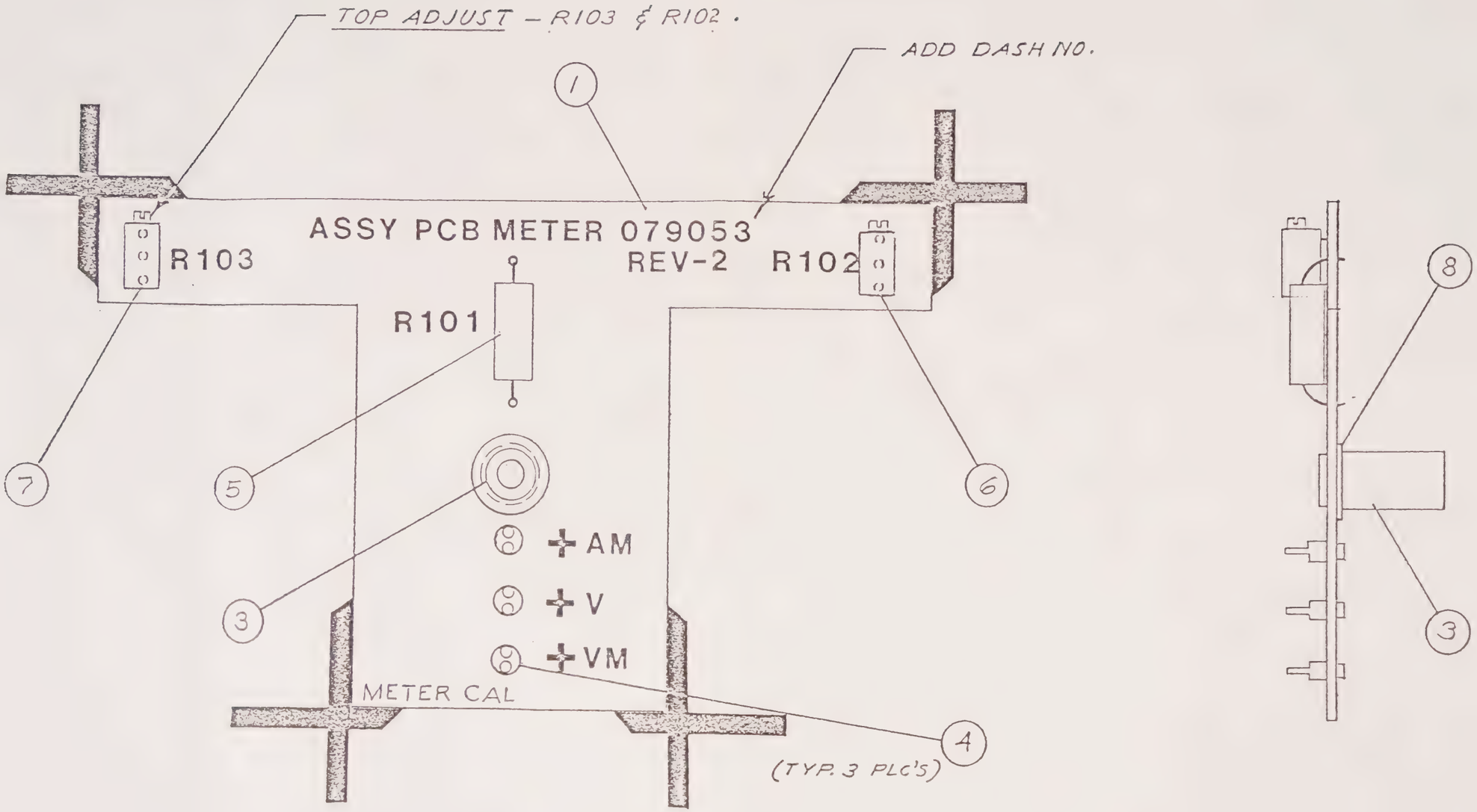
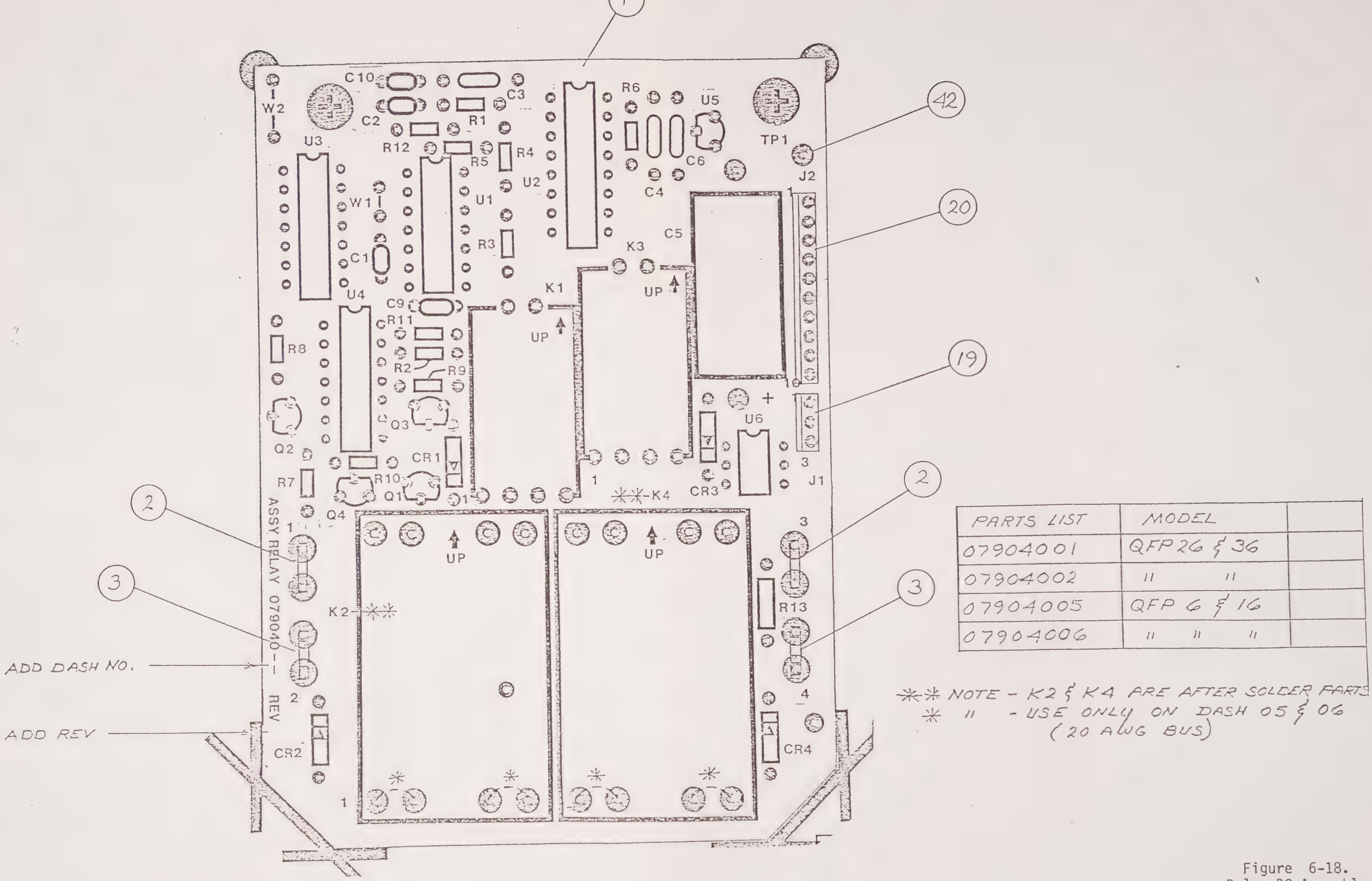


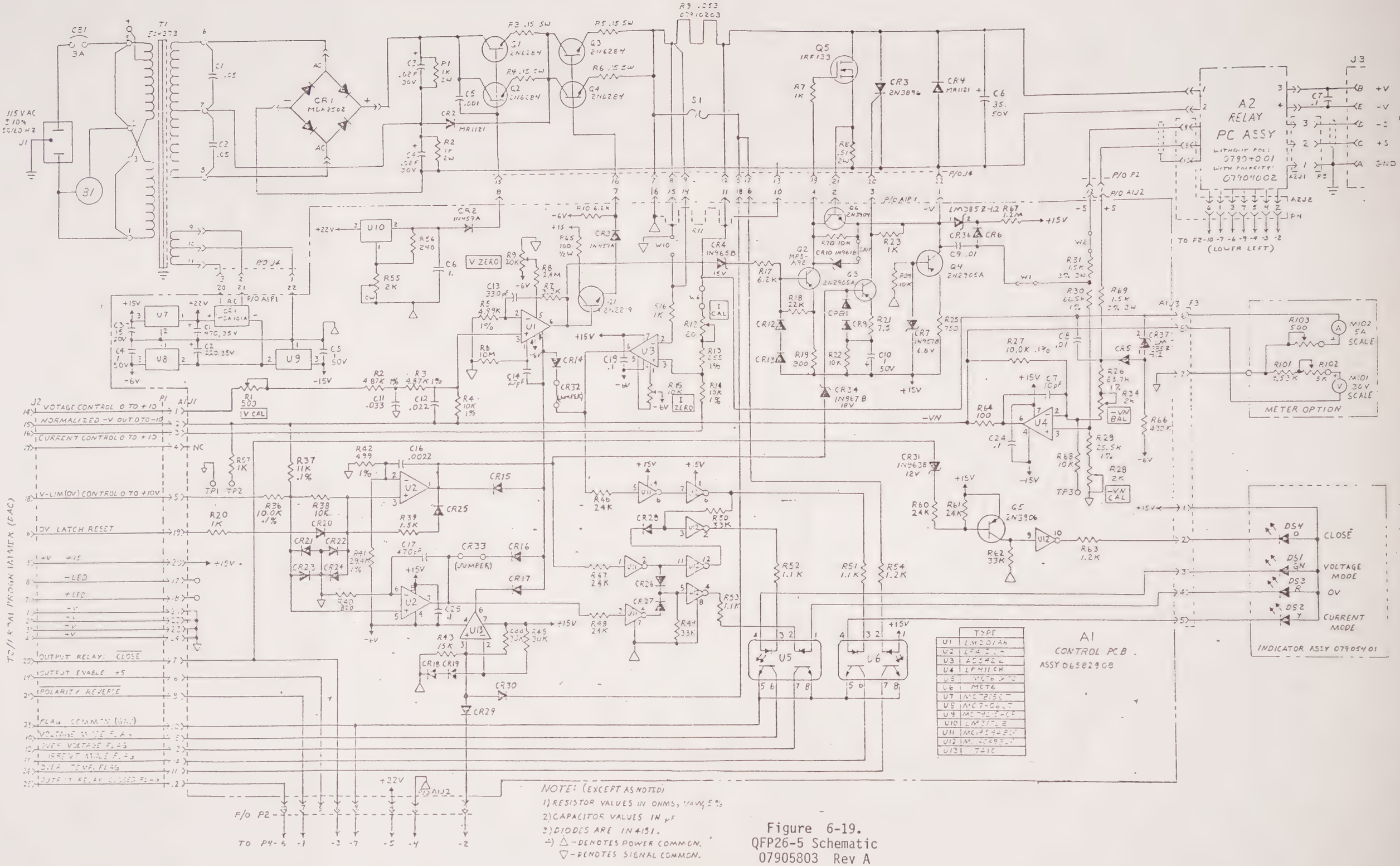
Figure 6-17.
Meter Cal PC Asembly
07905301 Rev A



PARTS LIST	MODEL	
07904001	QFP 26 & 36	
07904002	" "	
07904005	QFP 6 & 16	
07904006	" " "	

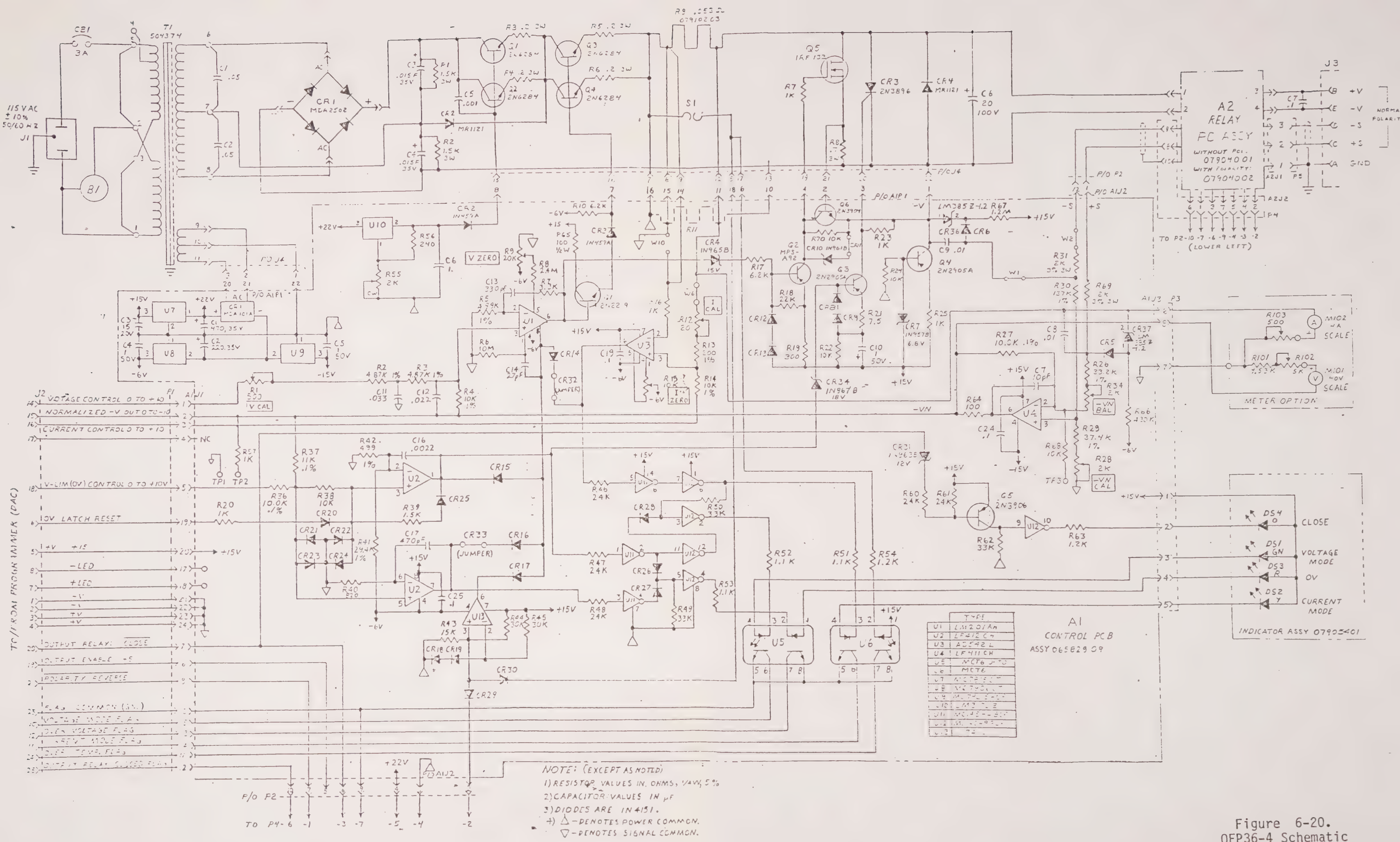
** NOTE - K2 & K4 ARE AFTER SOLDER PARTS
* " - USE ONLY ON DASH 05 & 06
(20 AWG BUS)

Figure 6-18.
Relay PC Assembly
079040TAB Rev A



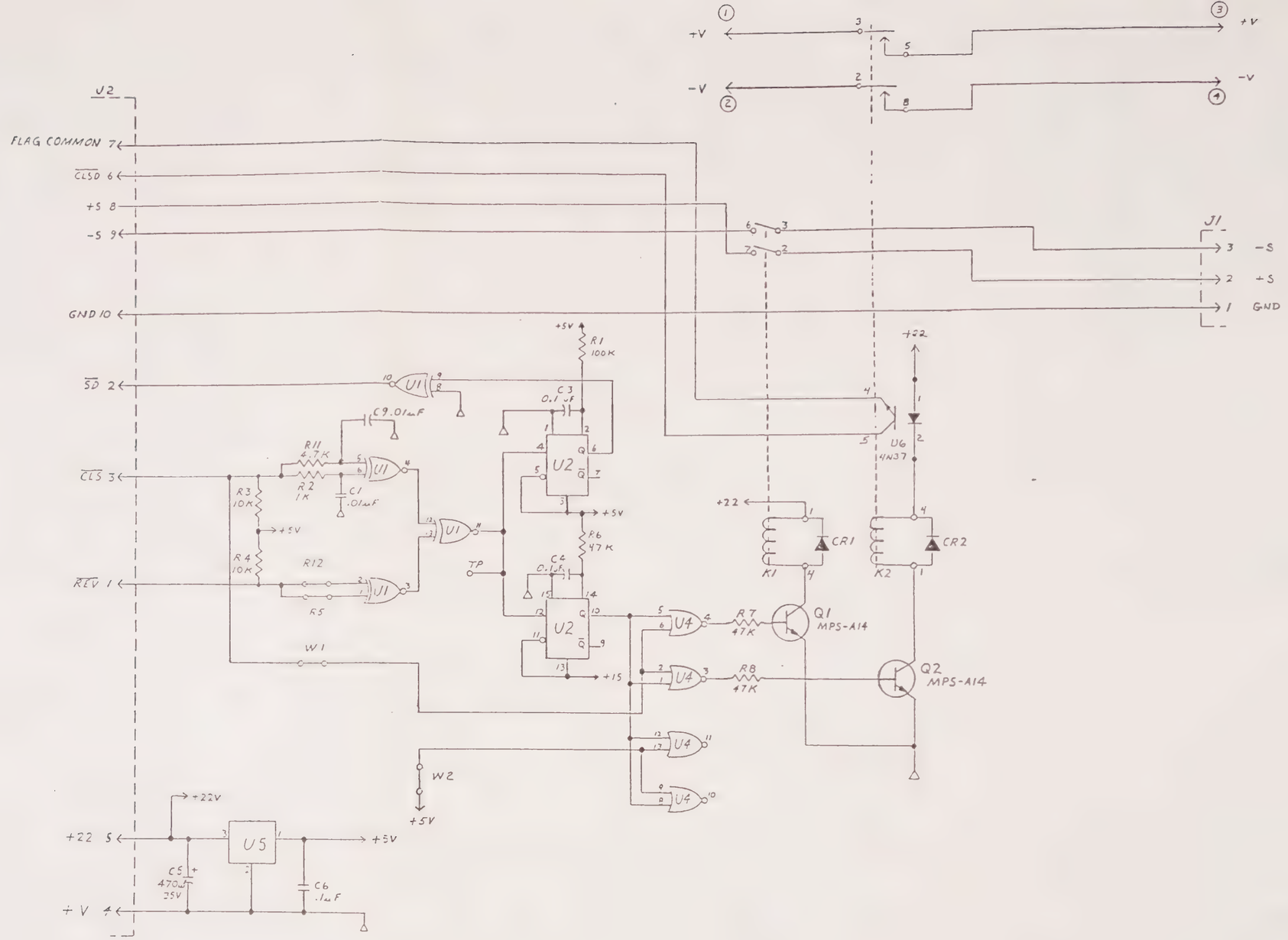
	TYPE
U1	LM201AH
U2	LF412CH
U3	AD542L
U4	LF411CH
U5	MCT6
U6	MCT6
U7	MC7815CT
U8	MC7906CT
U9	MC7915CT
U10	LM317LZ
U11	MC14584BCP
U12	MC14584BCP
U13	7211C

Figure 6-19.
QFP26-5 Schematic
07905803 Rev A



NOTE: (EXCEPT AS NOTED)
1) RESISTOR VALUES IN OHMS, ¼W, 5%
2) CAPACITOR VALUES IN μF
3) DIODES ARE IN4151.
4) △ - DENOTES POWER COMMON.
▽ - DENOTES SIGNAL COMMON.

Figure 6-20.
QFP36-4 Schematic
07905804 Rev A

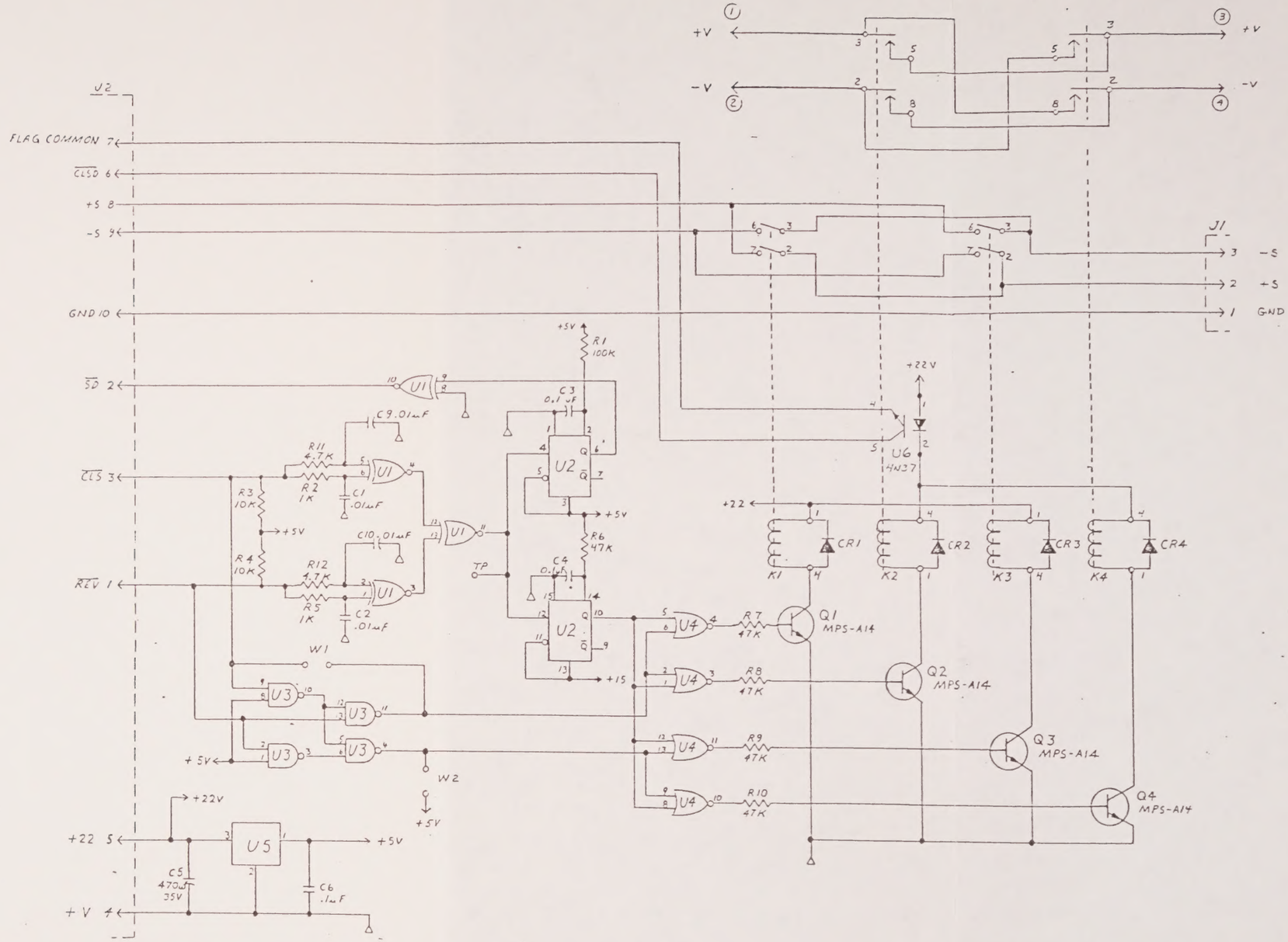


NOTES: 1) RESISTORS ARE ½ W 5% CARBON COMP.
2) △ DENOTES POWER COMMON.
3) CR1 & CR2 ARE IN4151

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	14538B	8	16
U3	NOT USED		
U4	14001B	7	14
U5	MCT8L05A		

Figure 6-21.
Single Polarity Relay Board
Schematic 07904001 Rev A



NOTES: 1) RESISTORS ARE ¼ W 5% CARBON COMP.
2) ⏚ DENOTES POWER COMMON.
3) CR1→ CR4 VALVES ARE IN4151

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	14538B	8	16
U3	14011B	7	14
U4	14001B	7	14
U5	MC78L05A		

Figure 6-22.
Dual Polarity Relay Board
Schemtic 07904002 Rev A

www.manualsplus.com
1025368